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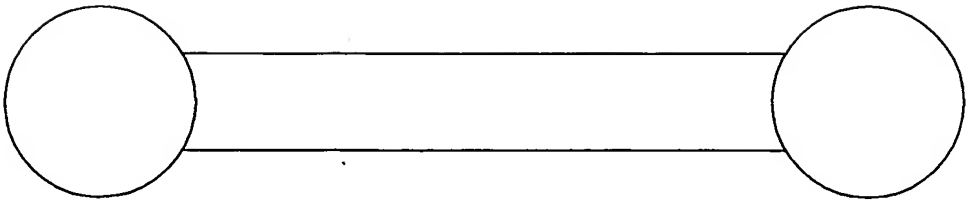


Four Node Network

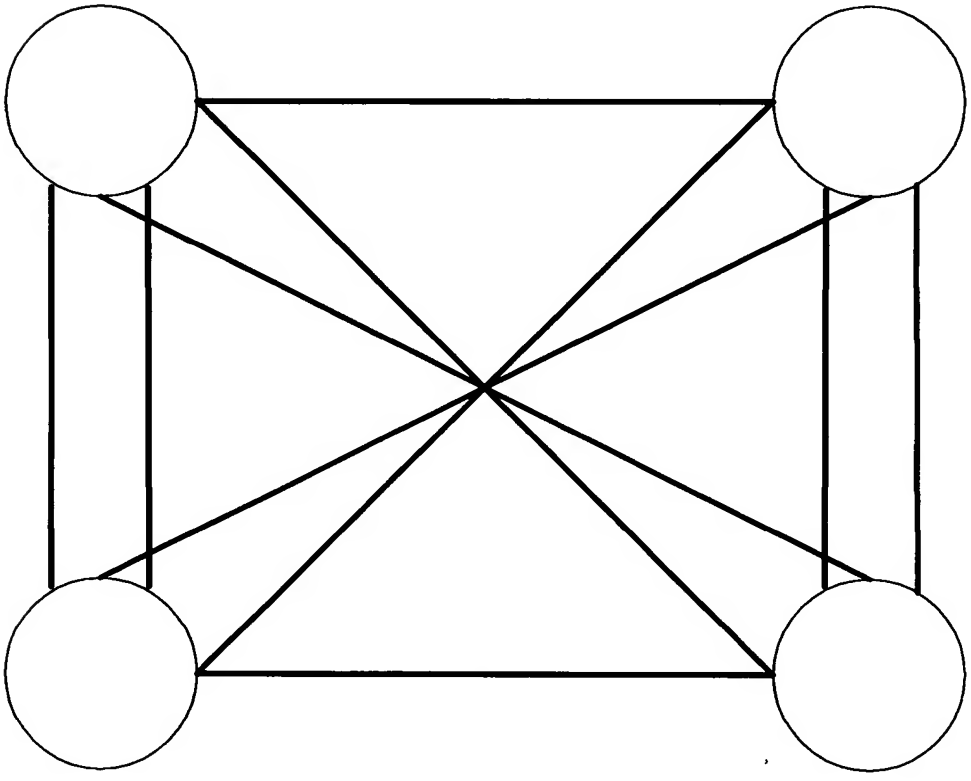


Fig.1

Complexity increases with network size
Figure 2

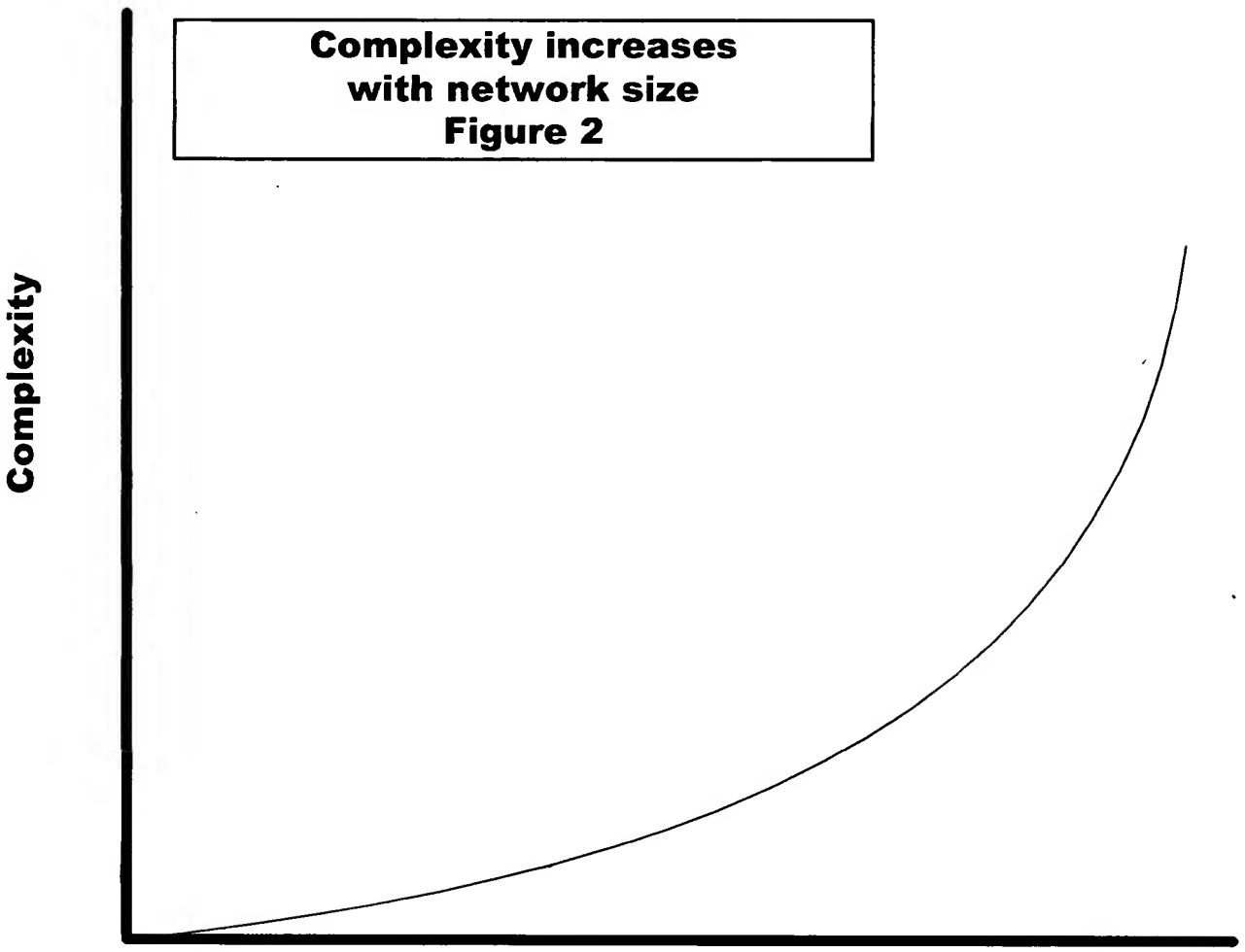


Fig.2

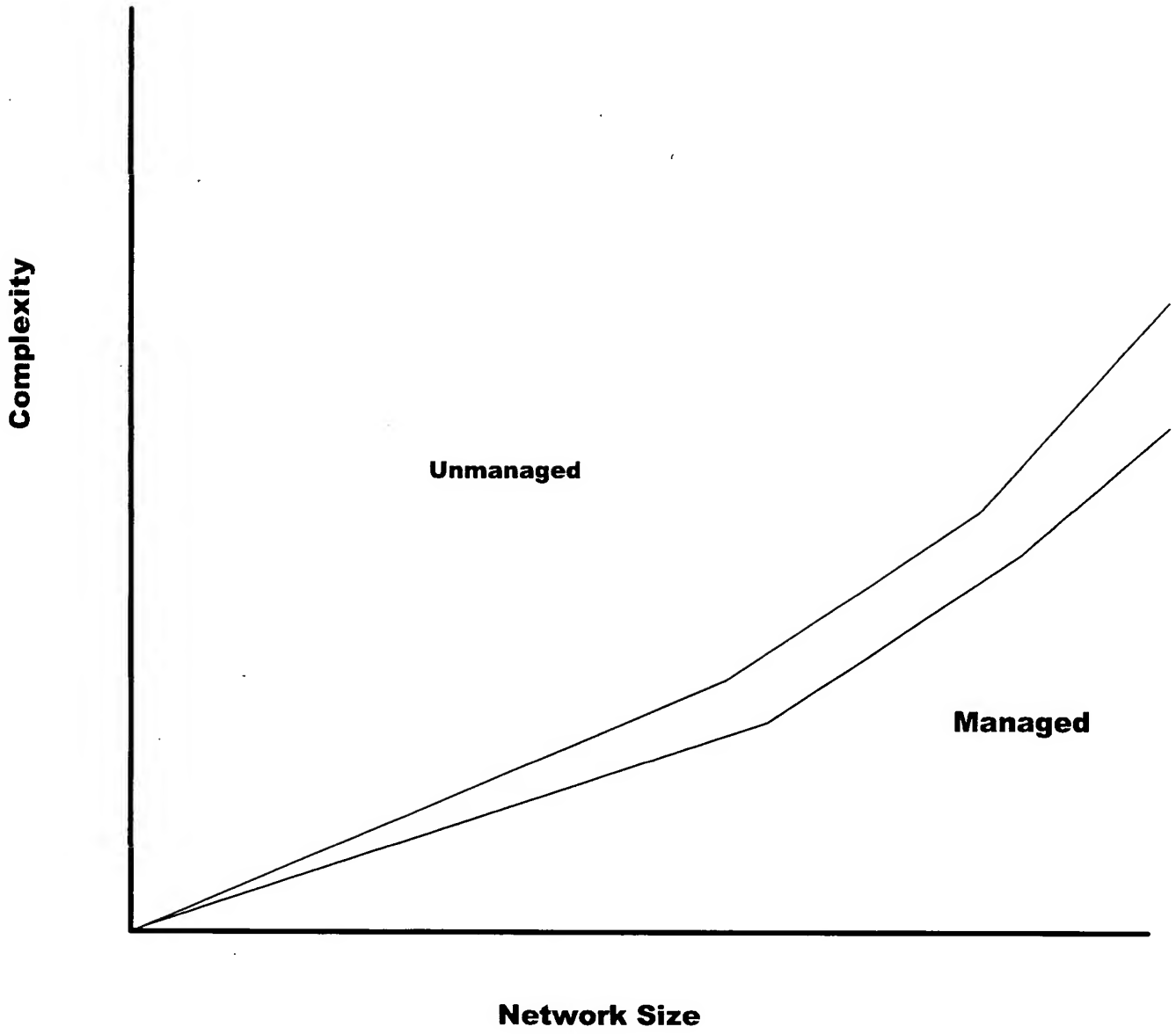
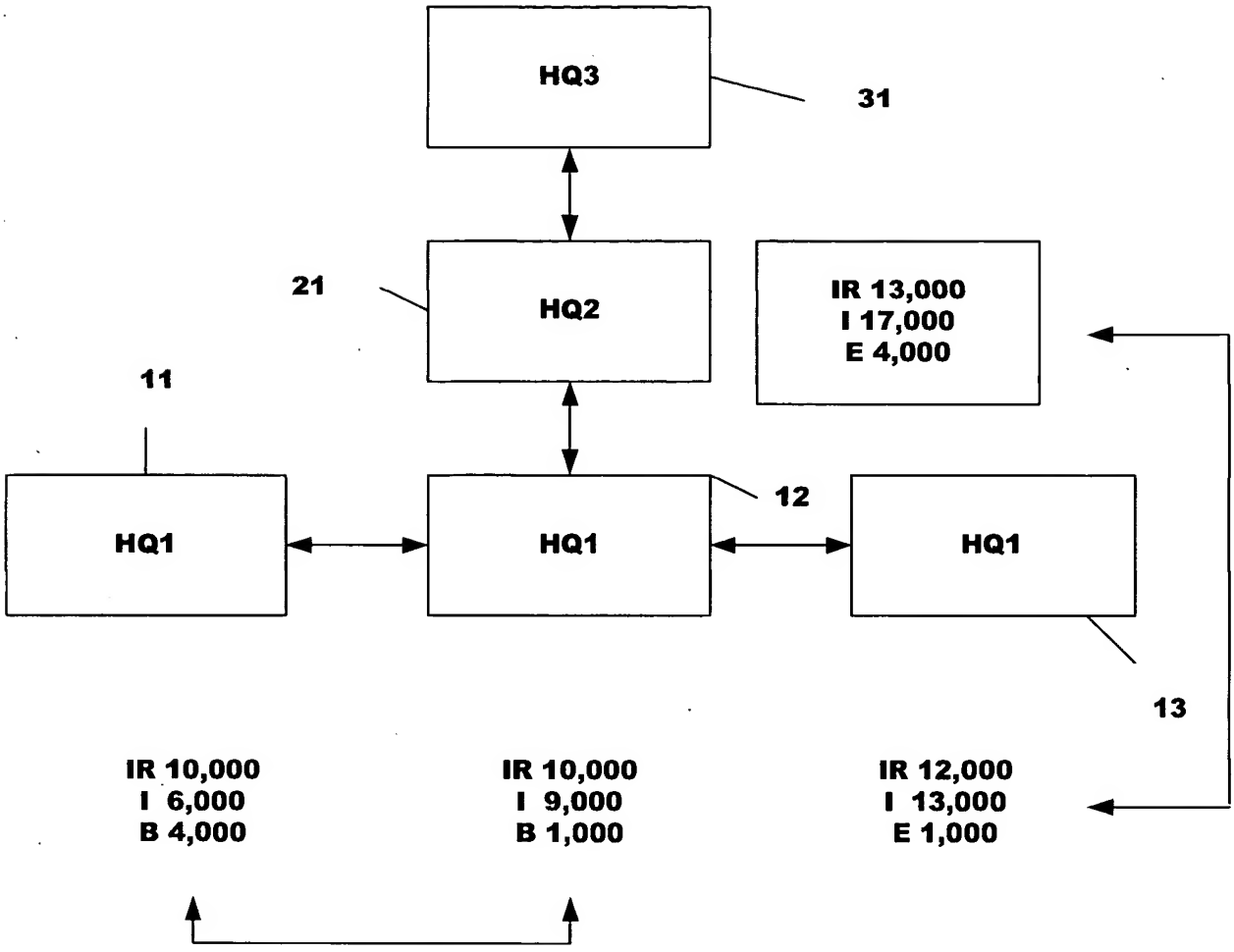


Fig.3



If no synergy exist and lateral integration among the components does not apply then 5,000 excess records are sent to the HQ3.
The HBS move and shift resources for maximun efficiency, thus a 5,000.
Buffer exist which is used to remove the 5,000 excess.

Fig.4

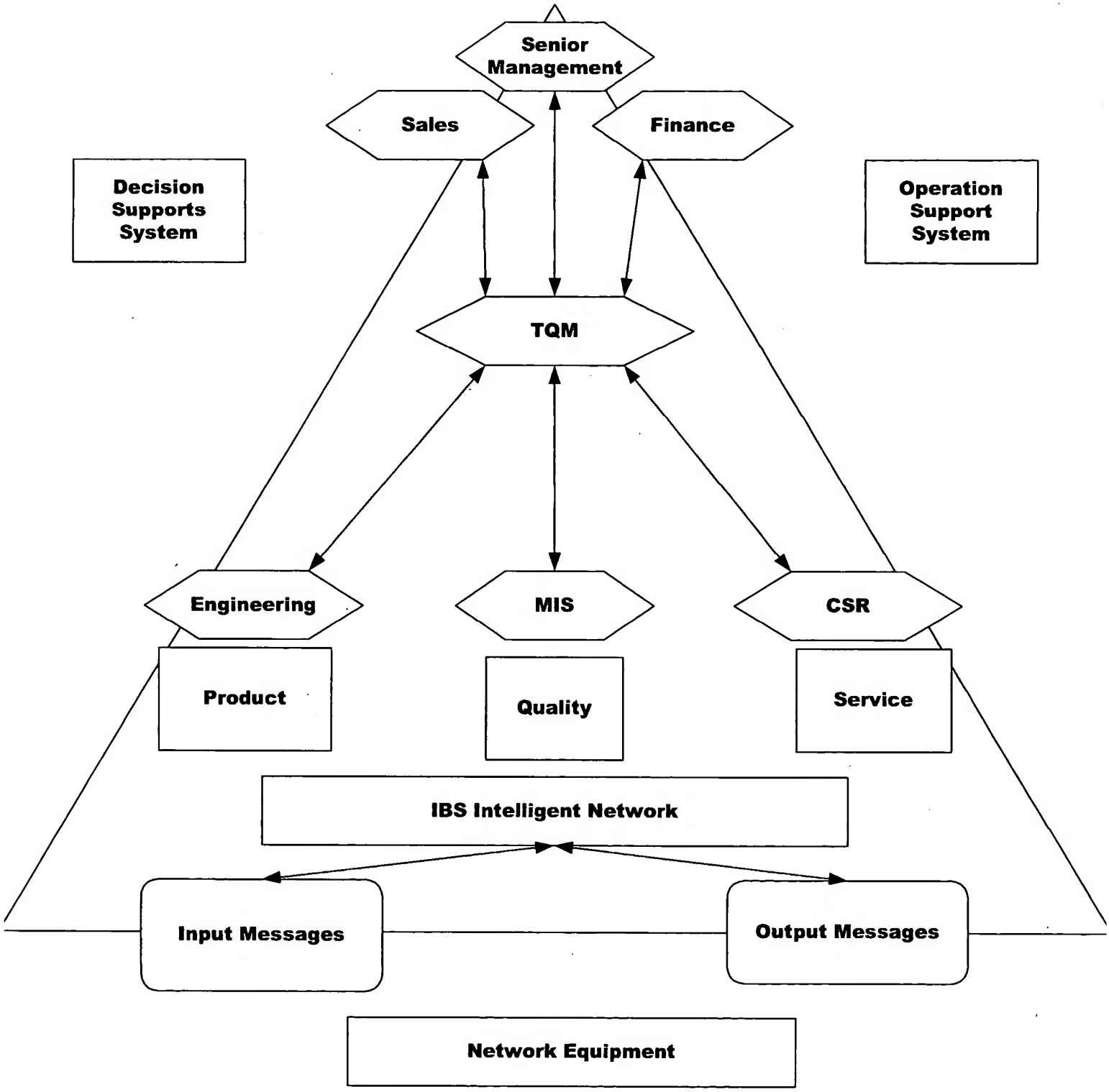

Senior Management
Sales
Finance
Decision Supports System
Operation Support System
TQM
Engineering
MIS
CSR
Product
Quality
Service
IBS Intelligent Network
Input Messages
Output Messages
Network Equipment

Fig.5

Complexity of Networks

Multiple Node System

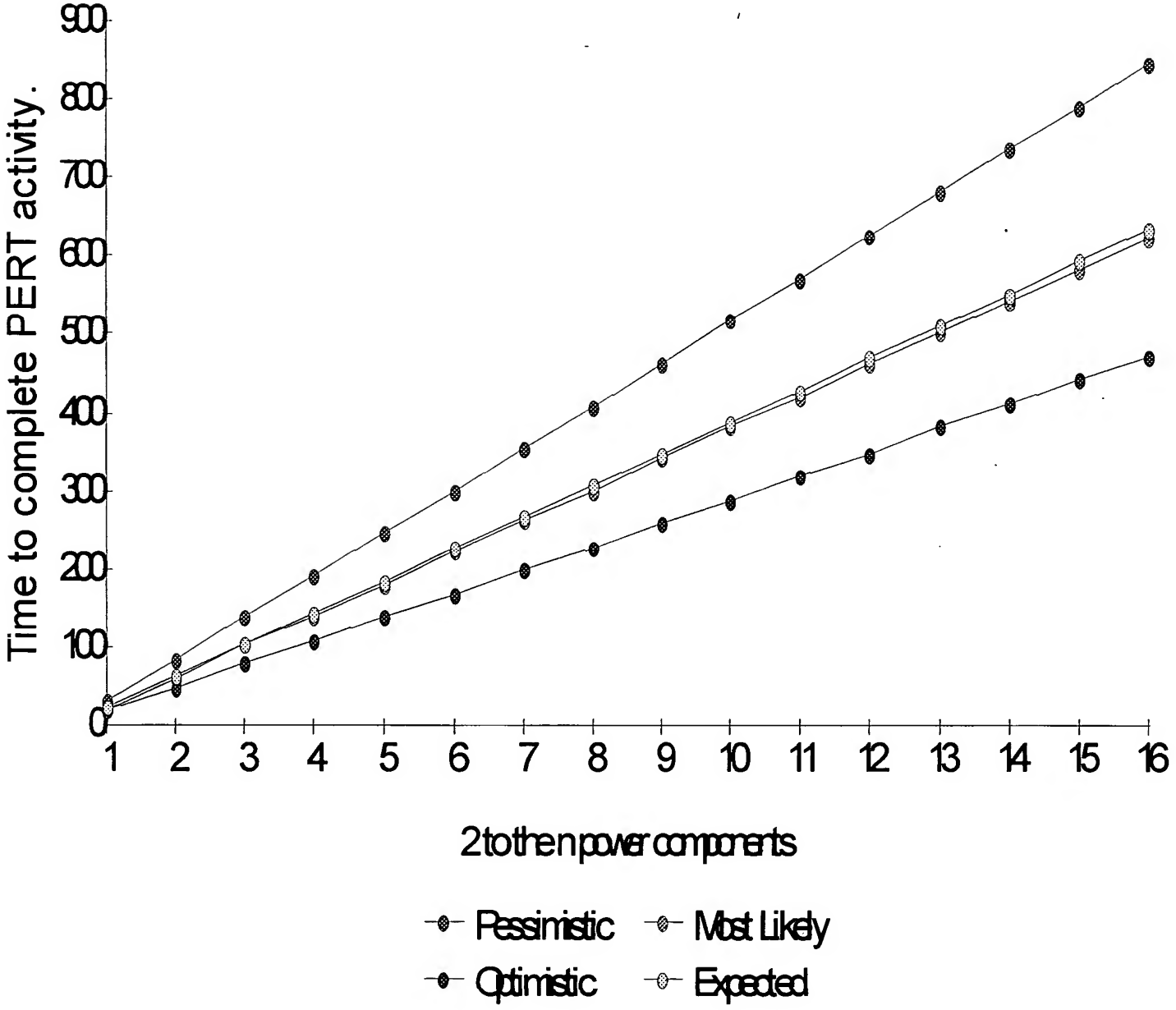


Fig.6

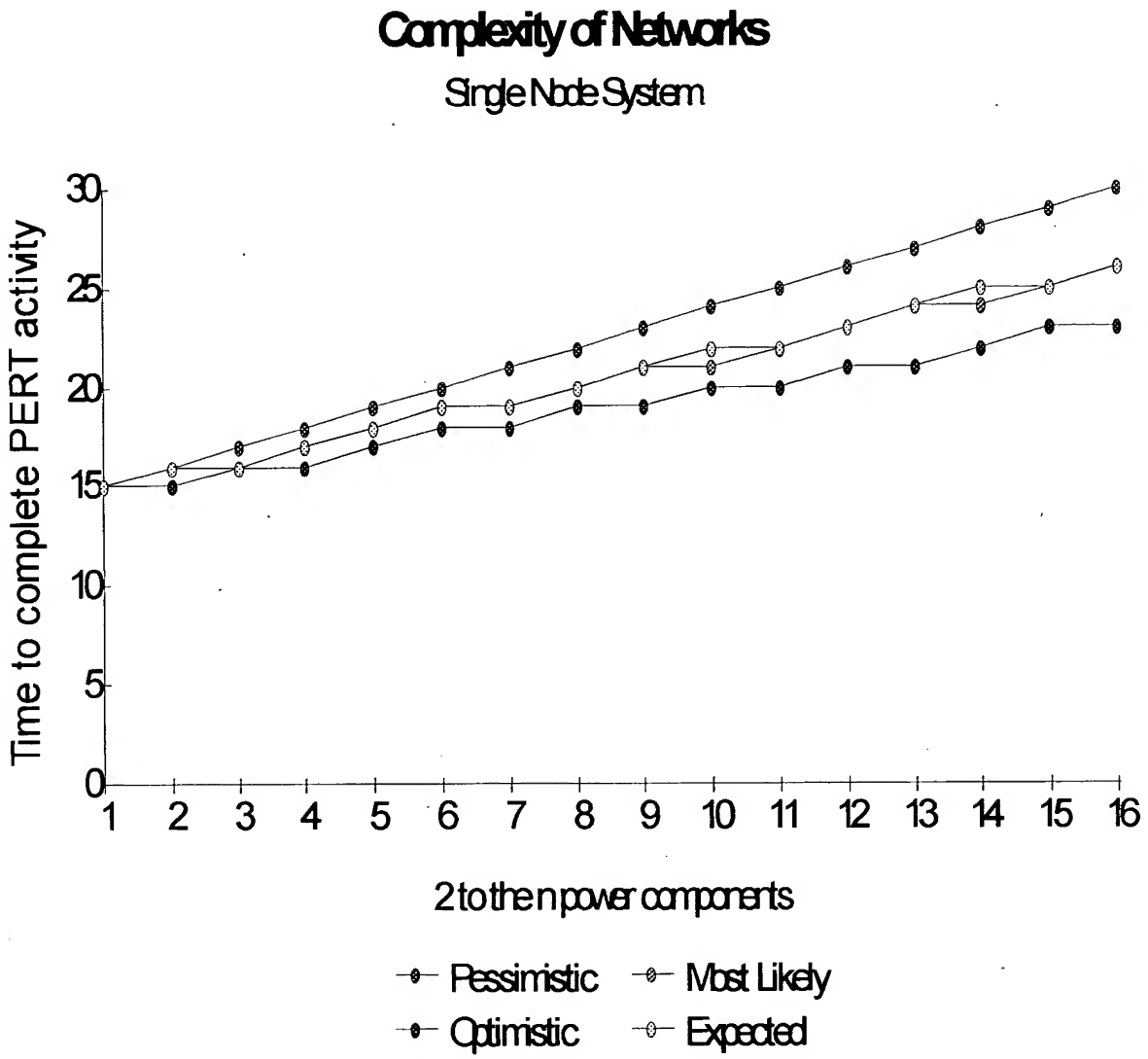
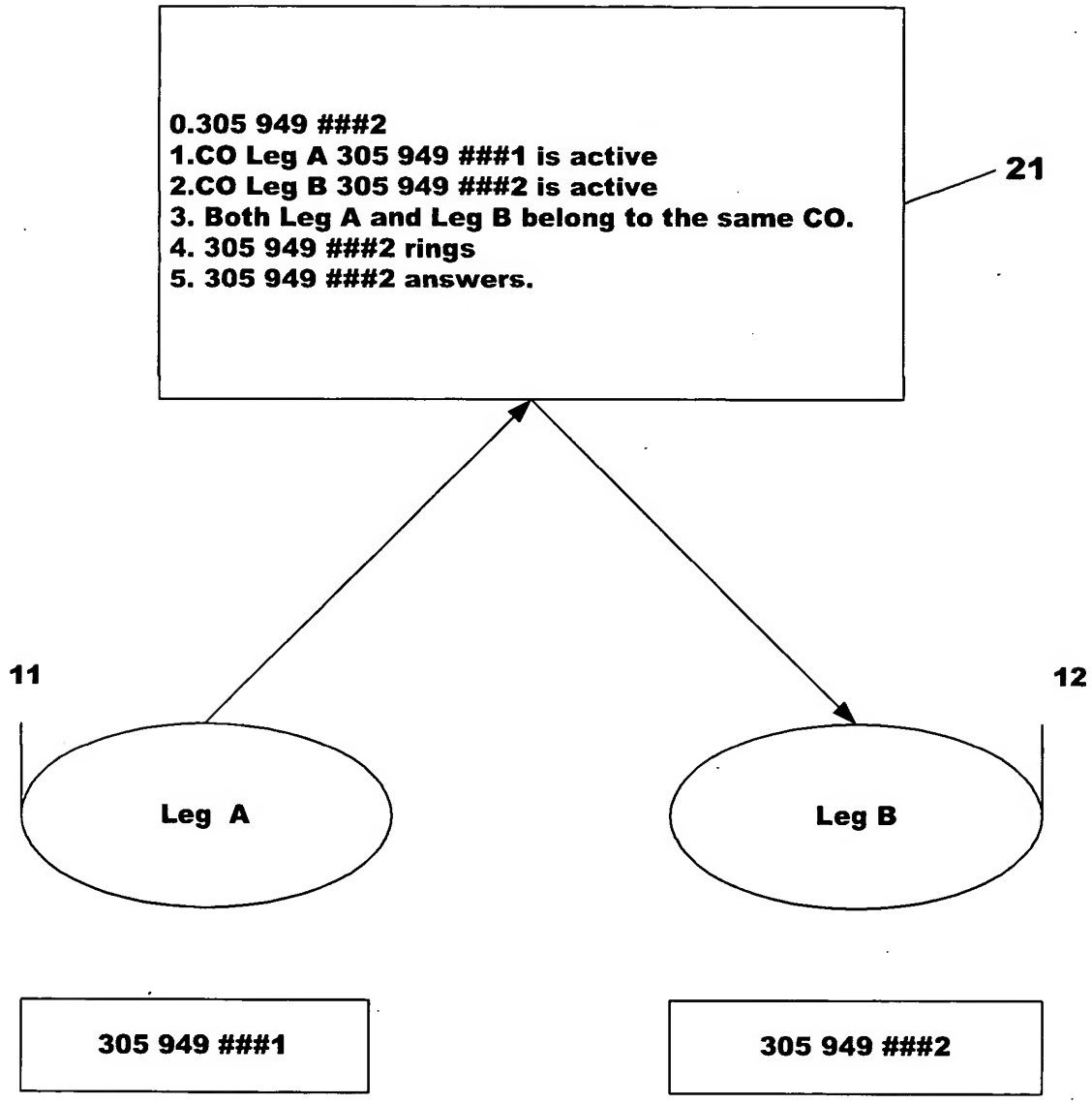

Complexity of Networks
Single Node System
Time to complete PERT activity
0
5
10
15
20
25
30
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
2 to the n power components
Pessimistic
Most Likely
Optimistic
Expected

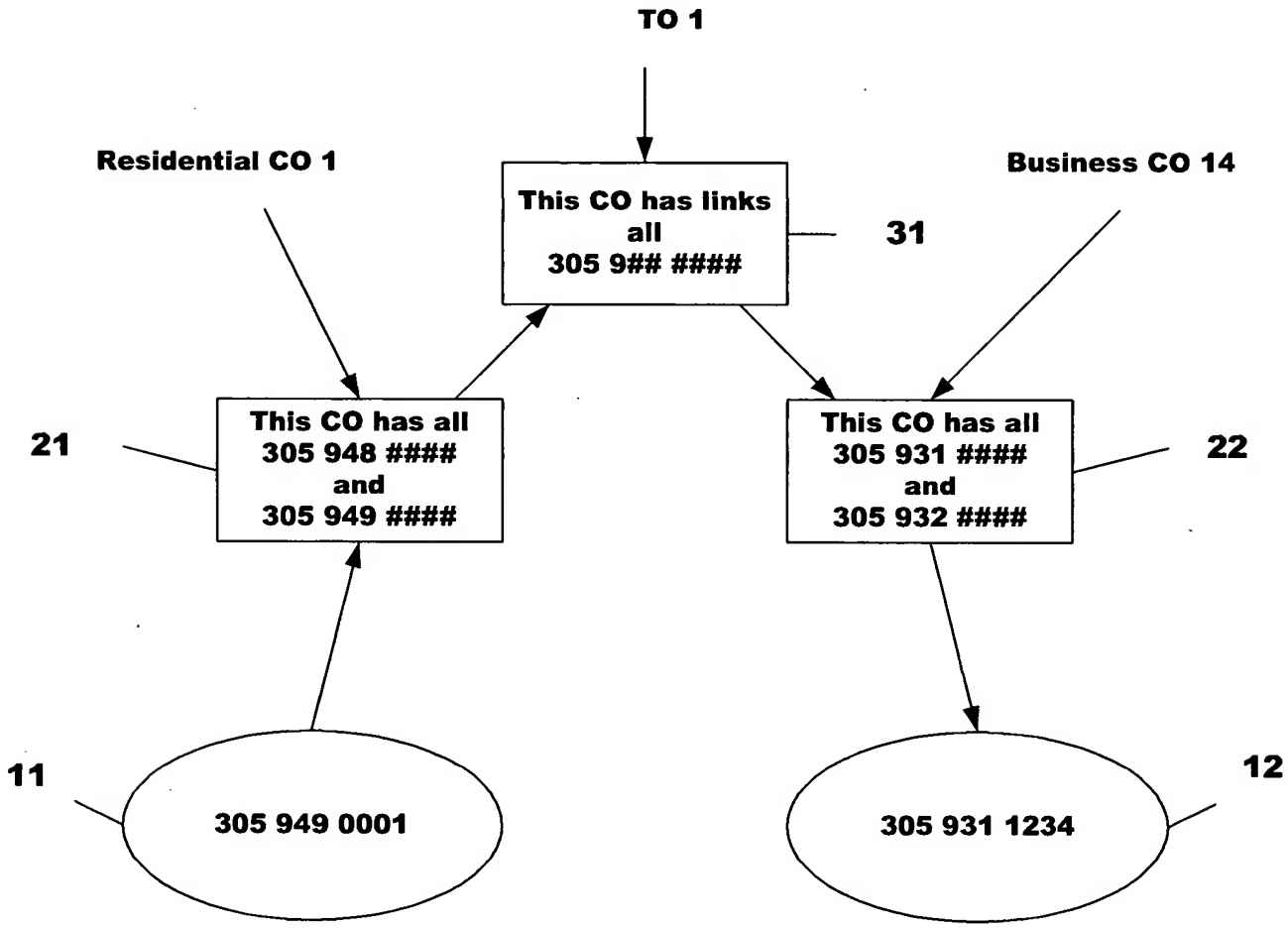
Fig.7



Both Leg A and Leg B are valid accounts and are off-hook.
The call is considered connected.

Fig.8

0.Leg A dials 305 931 1234
1.Call is considered connected



When Leg A and / or Leg B go on hook three CDR are generated. One for TO1, one for Residential CO1 and another for Business CO 14.

Fig.9

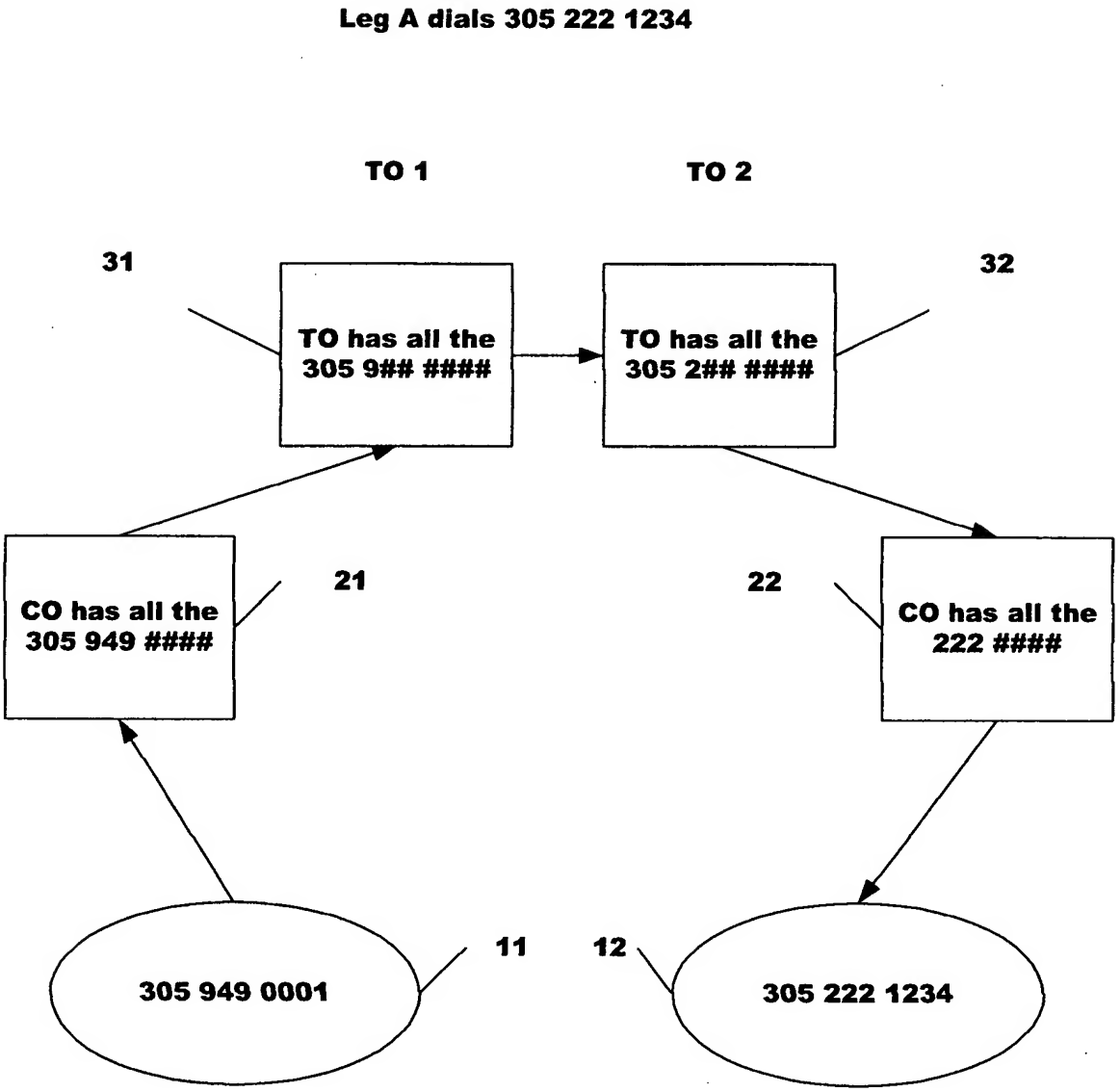
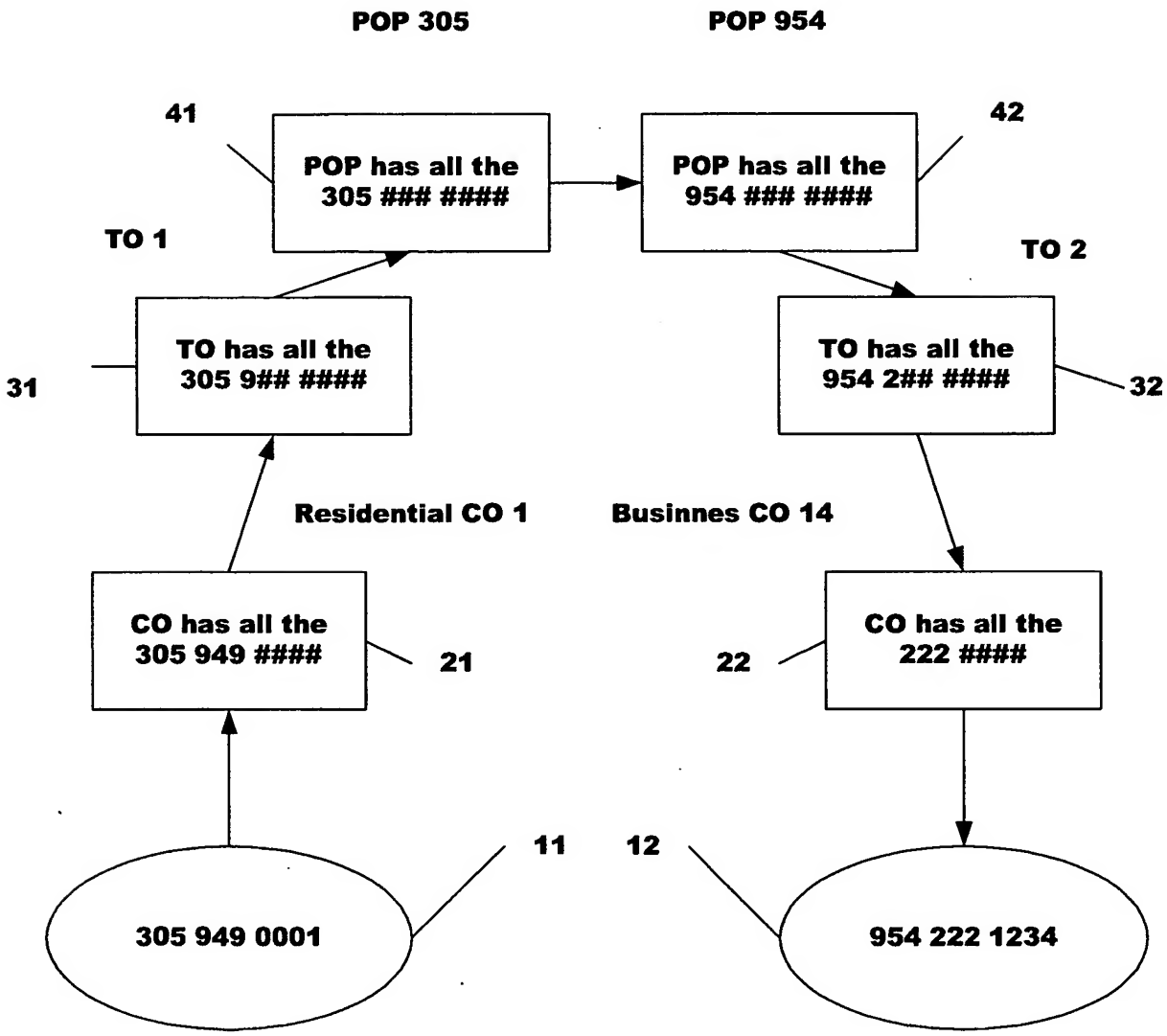

Leg A dials 305 222 1234
TO 1
TO 2
31
32
TO has all the 305 9## ####
TO has all the 305 2## ####
CO has all the 305 949 ####
CO has all the 222 ####
21
22
305 949 0001
305 222 1234
11
12

Fig.10

0. Leg A dials 954 222 1234 POP 305
1.Call is considered connected POP 954

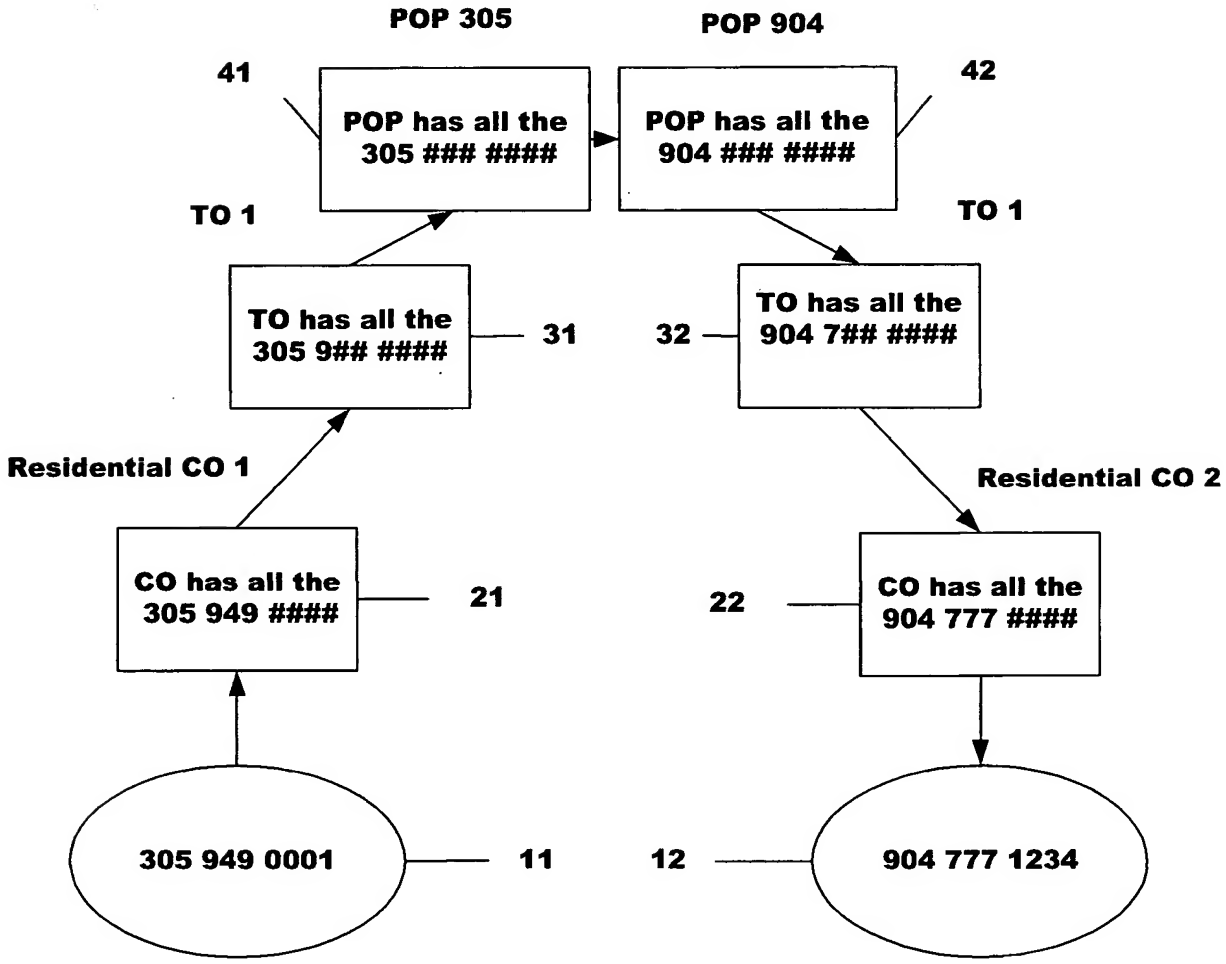


When Leg A and / or Leg B go on hook six CDR are generated. One CDR is obtained for each POP (305 or 954), one for each NXX and one for each local loop CO which contains the wiring for the 305 949 0001 and 954 222 1234 CPE or telephones.

Fig.11

0-Leg dials 954 222 1234

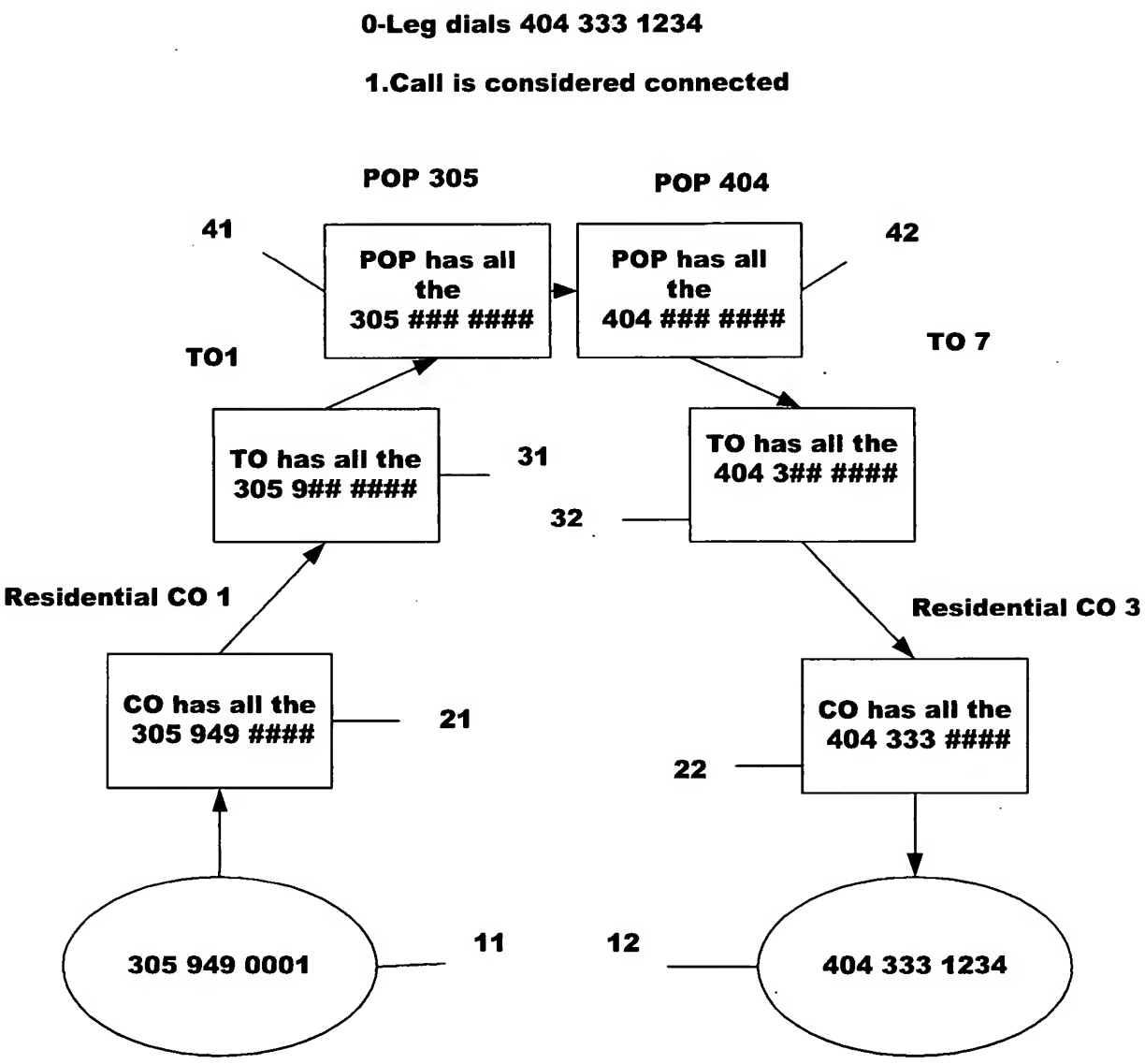
1.Call is considered connected POP 904



Might include a Tandem CDR, which link S Florida to C. Florida.

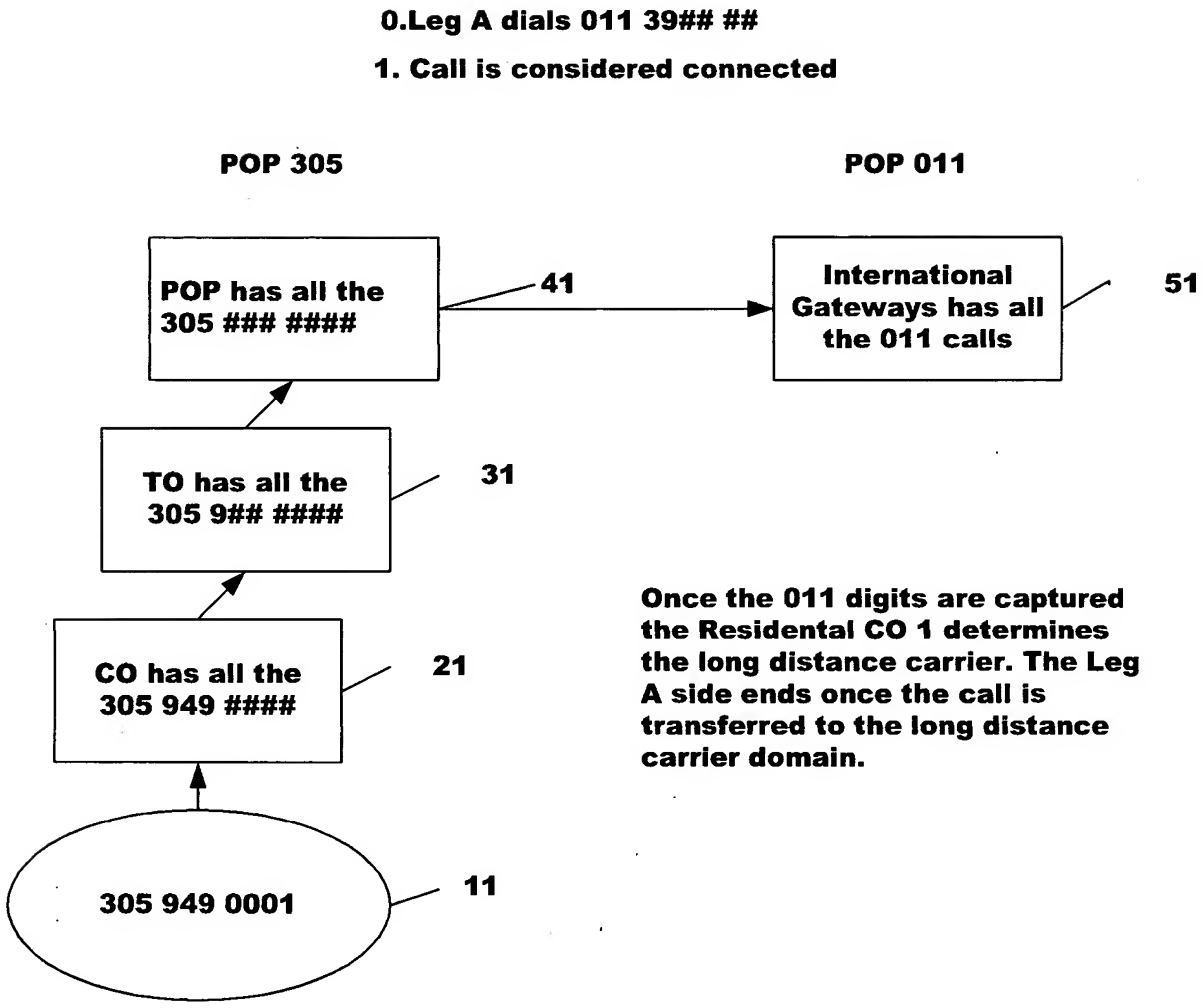
When Leg A and/or Leg B go on hook six CDR are generated. Each NPA generated the CDR one for NPA (305 or 954) POP, one for the NXX and for the local loop which contains the wiring for the 305 949 0001 and 904 777 1234 CPE or telephones.

Fig.12



When Leg A and/or Leg B go on hook six CDR are generated. Each NPA generated the CDR one for the (305 or 404) POP, one for the NXX and for the local loop which contains the wiring for the 305 949 0001 and 404 333 1234 CPE or telephones.

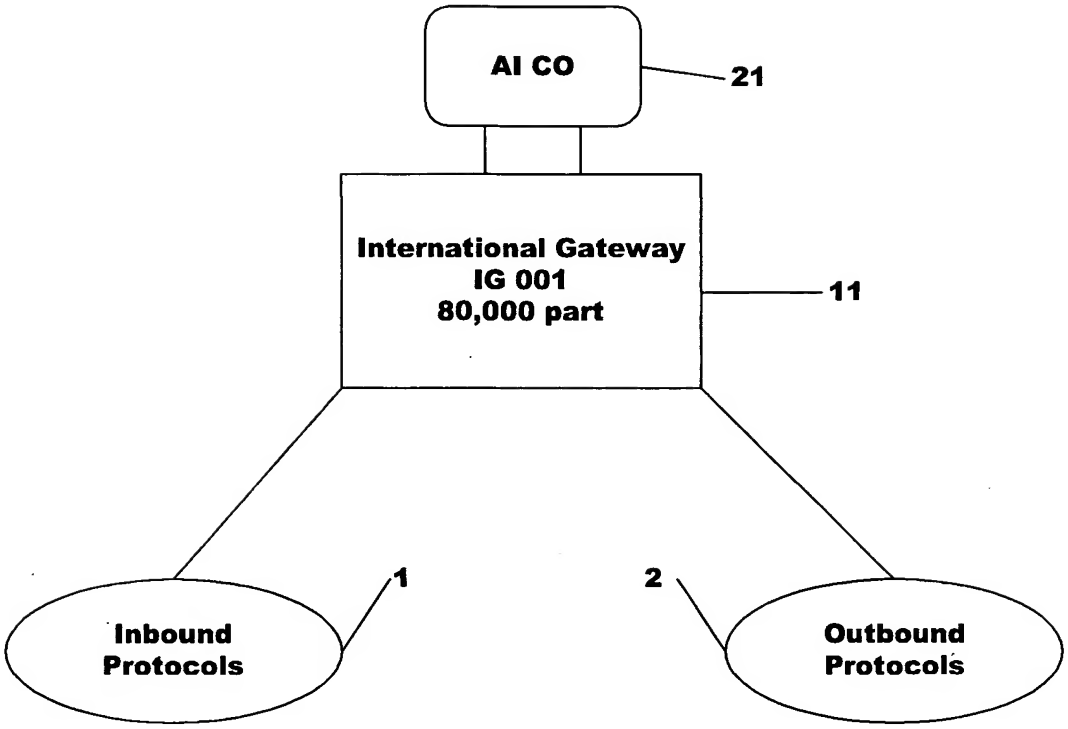
Fig.13



When Leg A or Leg B go on-hook three CDR are generated. One CDR for the International Gateway (POP) one for the exchange Central Office, and the Residential CO originating the call.

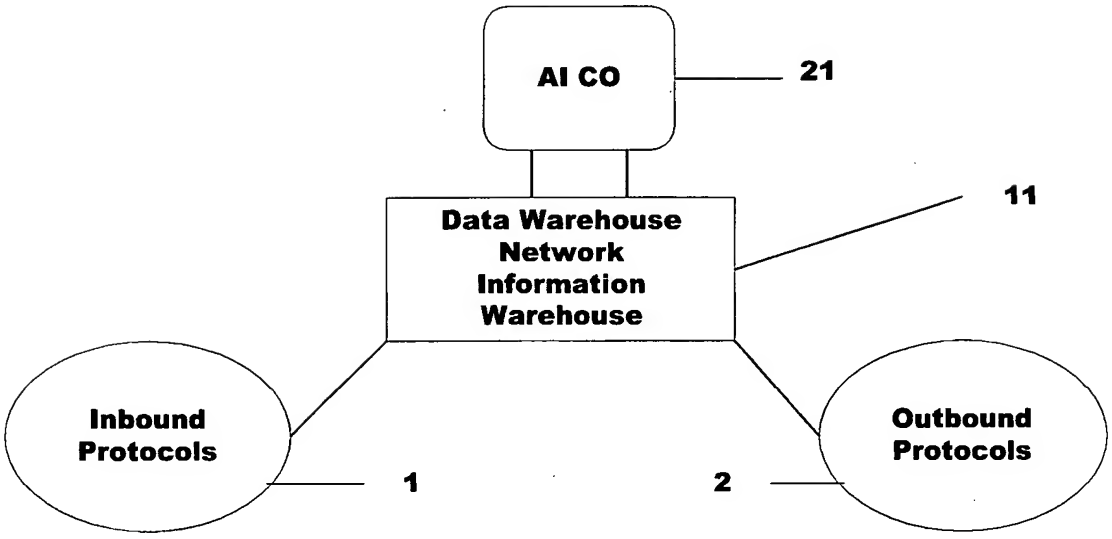
Note: Domestic long distance calls will behave in the same manner as International Long Distance calls.
Calls within the Bell South domain that are routed to other networks will possess 2 CDR if within
the same NPA. Otherwise the call will have 3 to 5 CDR. For simplicity the average of four CDR has been used.

Fig.14



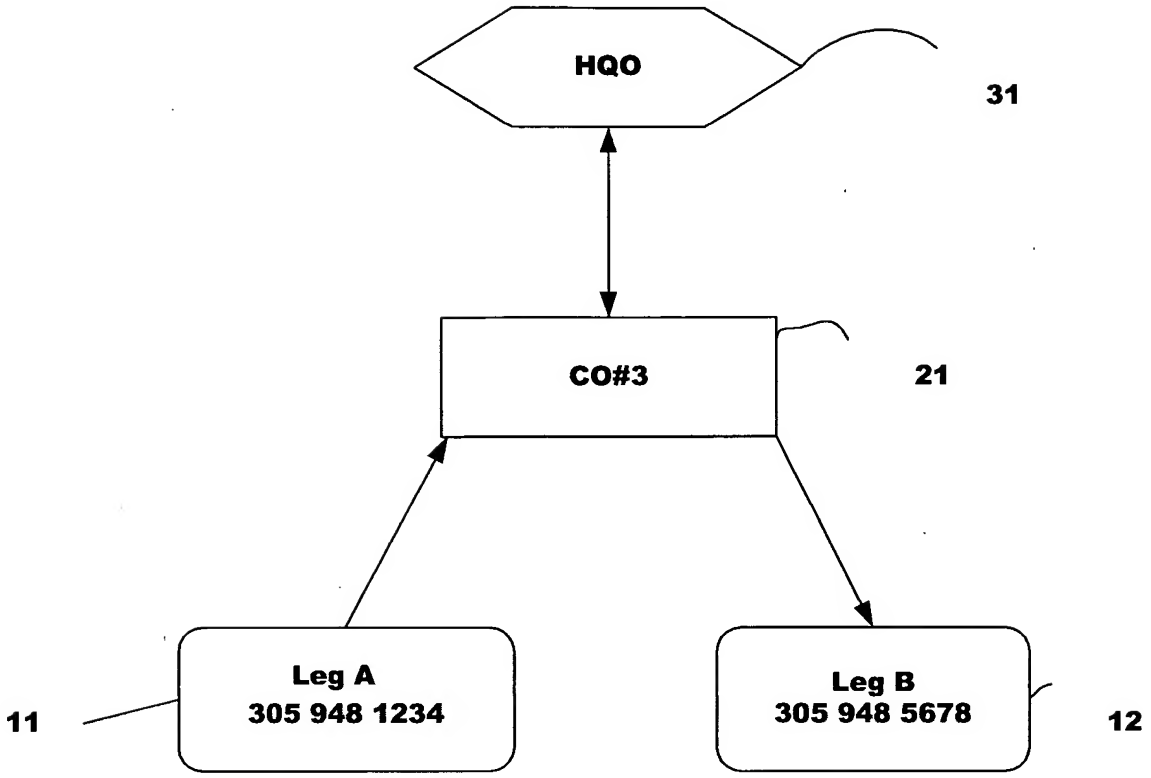
Every minute up to 15,000 CDR are processed. The AI component scans the environment every second.(Genesis Engine Foot Soldier)
Every 5 seconds a new fuzzy state cycle begins.
Every time a new billable entity is generated the AI CO analyses the Trunk information, Leg A and Leg B information to properly rate the call.
For every billable entity the CO generates a unique ID.
Example IG 001########.
When the CDR containing the end time of the call is received the system is able to complete the billable entity. At this point the information is sent to the billing engine

Fig.15



Every minute up to the rated limit of CDR are processed.
The AI component scans the environment every second.
Every 5 seconds a new fuzzy state cycle begins.
Every time a new billable entity is generated the AI CO analyses the trunk information, Leg A and Leg B information to properly rate the call.
Every minute, and in each binary time interval the Data Warehouse receives updates from its hierarchy and other IDW/ INIW to determine system integrity and immediately identifies potential churn subscribers.
Provisioning statistics as well as trending are the key Component of this Data Warehouse that also is an IC.

Fig.16

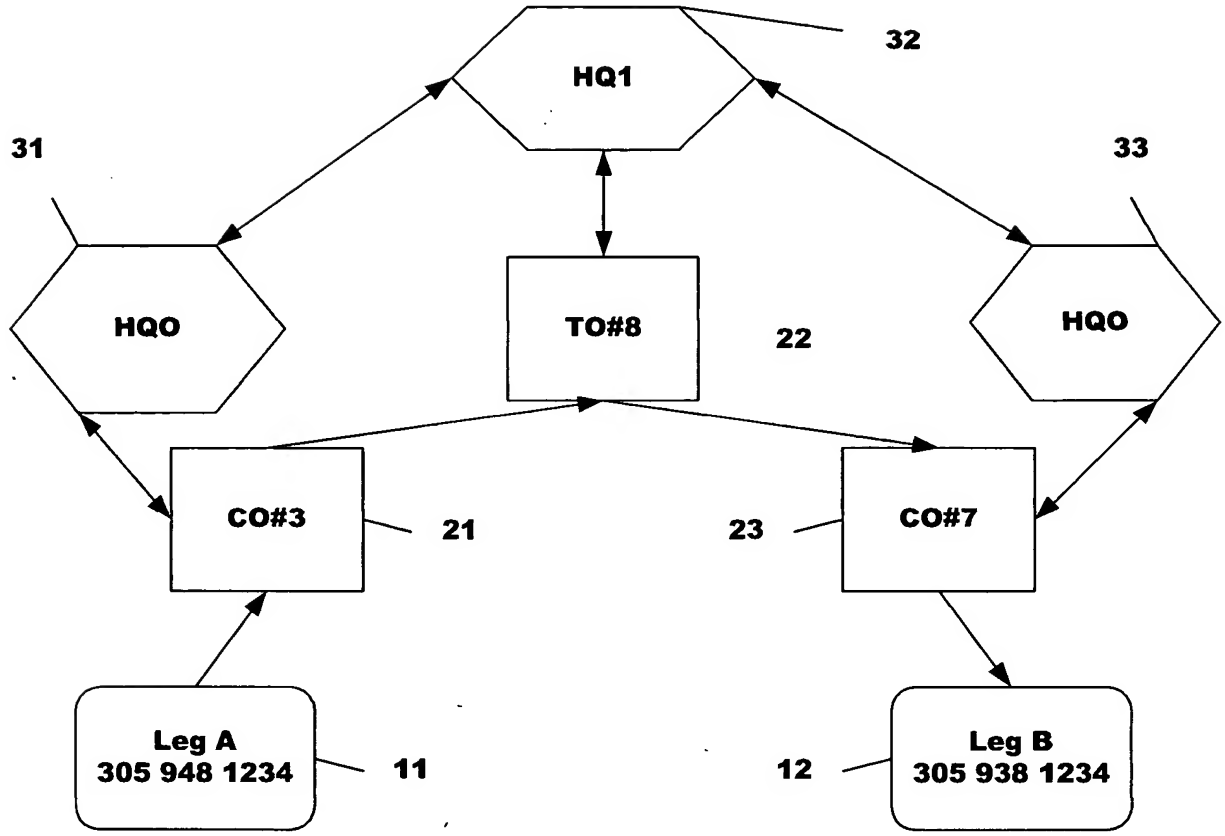


HQ6 1
HQ5 is BST 1 HQ2 is Miami 4
HQ4 is Florida 1 HQ1 is Miami 8
HQ3 is S.Fla 3
Leg A is 11134803 Leg B is 11134803

CO 1134803 initiates the call.
CO 1134803 Owns and generates the Vector CDR.
1 CDR must be correlated to make the billing entity.
Vector Magnitude looks like this 1134803 (Owner) N/A (Leg A CO) N/A (Leg B CO) 1134803
The unique ID for the call would be 1134803########

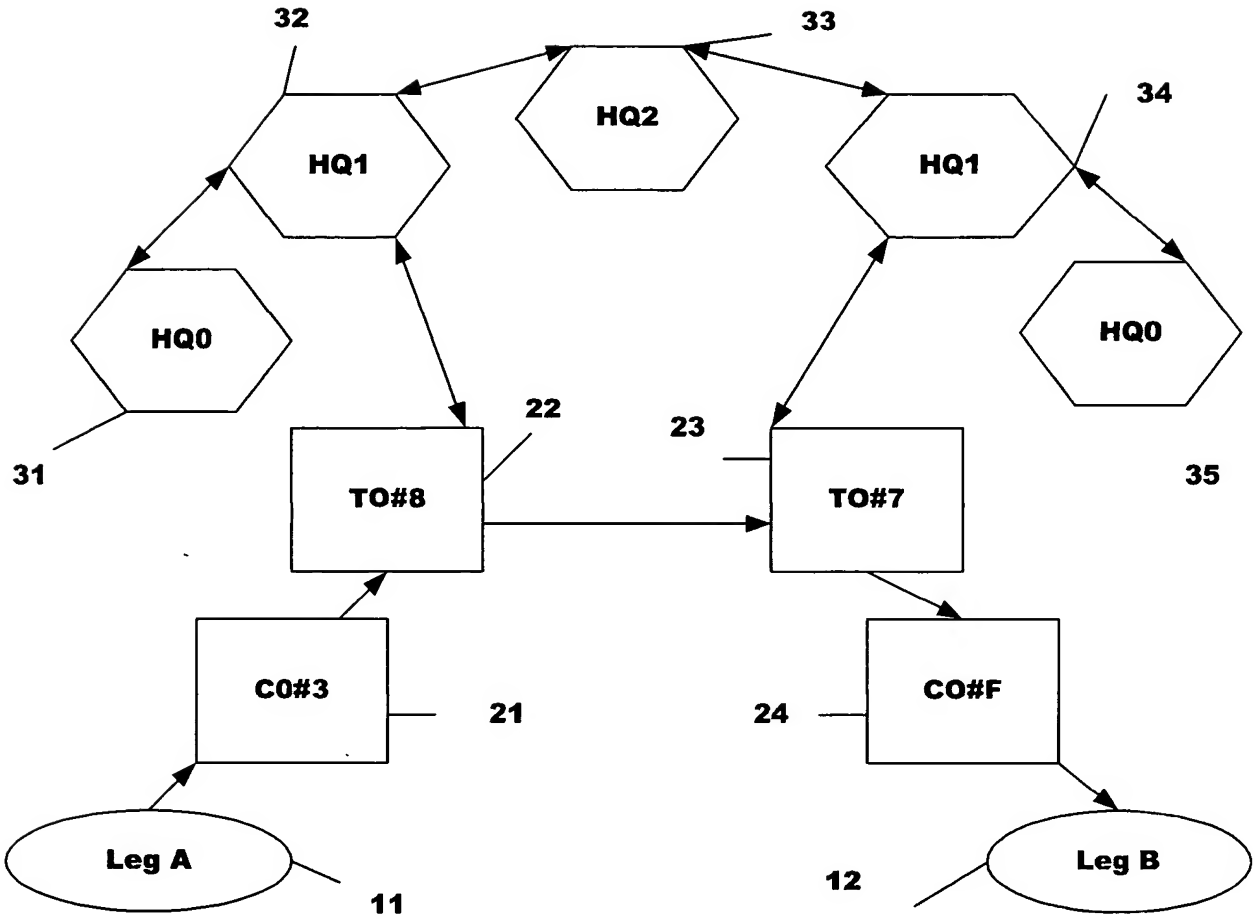
1134803aaaa0000000000. Four letters and 0-16,777,216 range. This would be the first call this specific switch could possibly perform.

Fig.17



HQ 5 is BST 1
HQ4 is Florida 1
HQ3 is S. Fla 3
HQ2 is Miami 4
HQ1 is Miami 8
Leg A is 1134803
Leg B is 1134807
CO 1134803 initiates the call. CO 11348 ows the call
And generates the Vector CDR. 3 CDR must be
Correlated to make the billing entity.
Vector Magnitude looks like this 11348 (Owner)
03 (Leg A CO) 07 (Leg B CO) 11348-0307
The unique ID for the call would be 1134803 ########
1134803aaaa0000000000.Four letters and 016,777,216
range. This would be the first call this specific switch
could possibly perform.

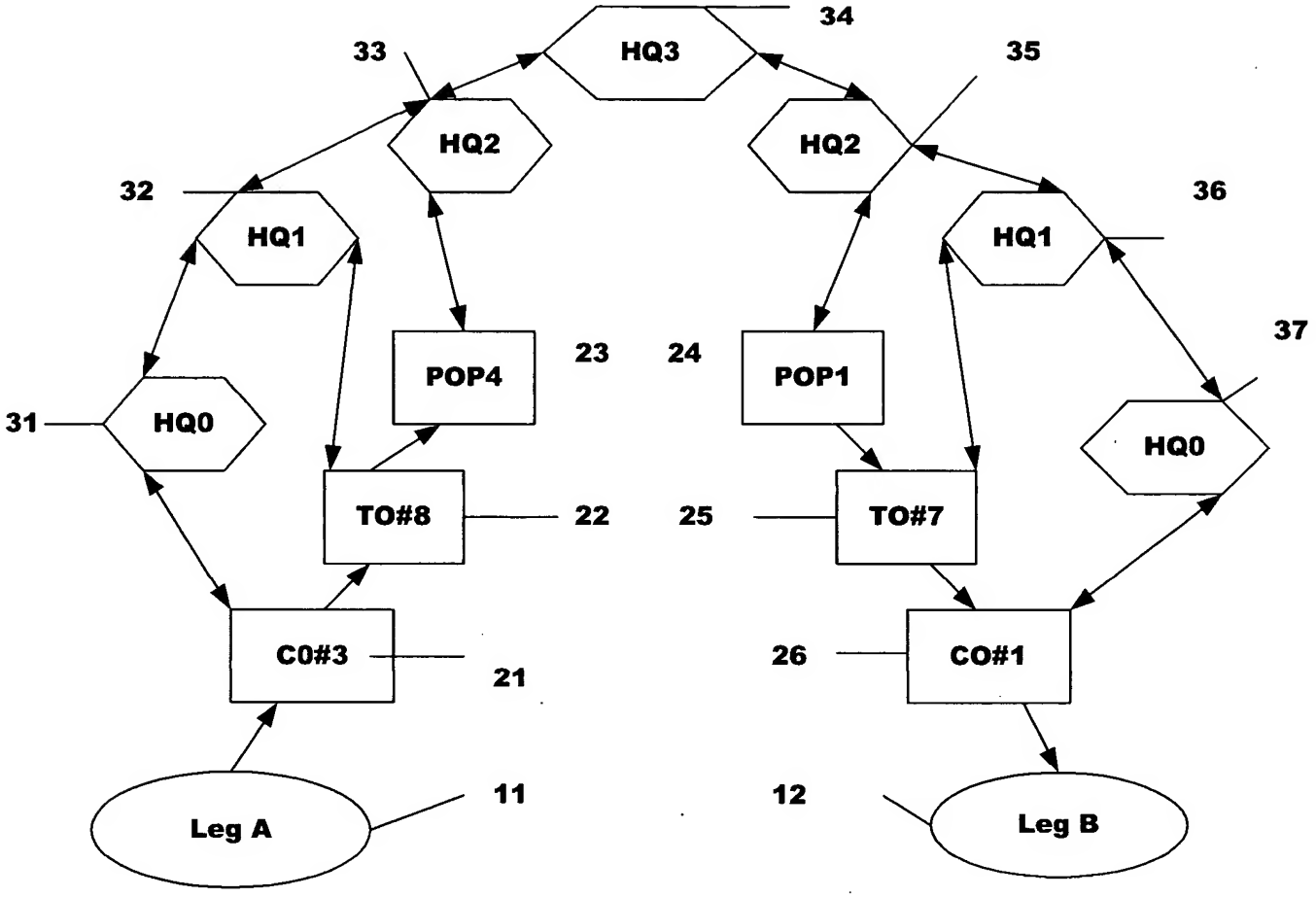
Fig.18



305-9490001 **305 443 2354**
North Miami Beach **Coral Gables**
HQ6 **1**
HQ5 BST **1** **HQ1 Leg A** **8**
HQ4 Florida **1** **HQ 1 Leg B** **7**
HQ3 S. Fla **3**
HQ2 Miami **4**
Leg A is 11134803 **Leg B is 1113470F**
CO 1134803 initiates the call. CO 1134 owns the call and generates the Vector CDR. HQ2. At least 4 CDR must be correlated to make the billing entity.

Vector Magnitude looks like this: 1134 (Owner) 803 (Leg A CO) 70F (Leg B CO) 1134-803-70F

Fig.19



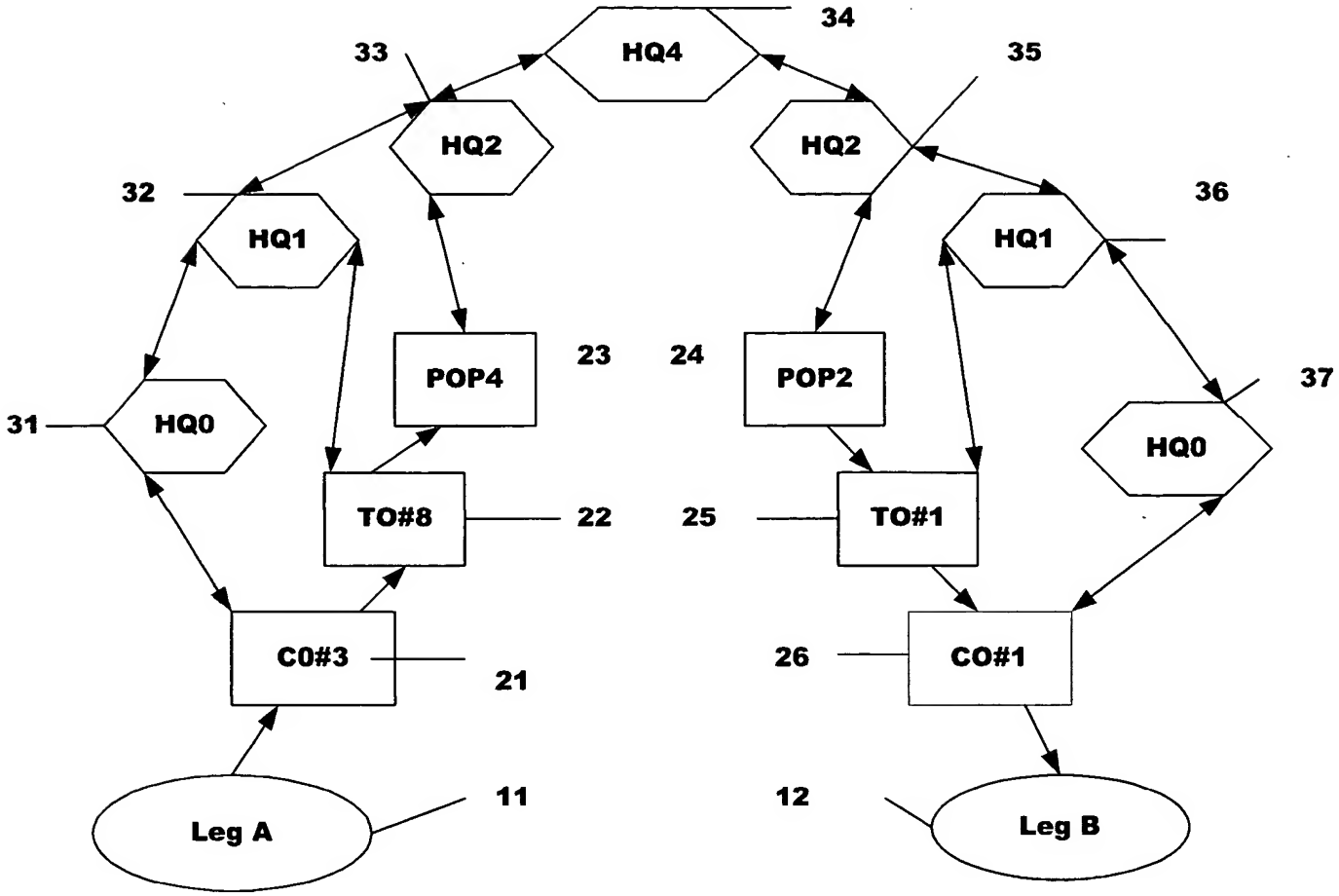
305-9490001
Miami
HQ5 BST 1
HQ4 Florida 1
HQ3 S. Fla 3
HQ1 LEGB 7

407 671 9999
Orlando
Leg A 4
HQ2 Leg B 1
HQ 1 Leg A 8

Leg A is 1134803 **Leg B is 1131701**
CO 1134803 initiates the call. CO 113 owns the call and generates the Vector CDR. HQ3. At least 6 CDR must be correlated to make the billing entity.

Vector Magnitude looks like this: 113 (Owner) 4803 (Leg A CO) 1101 (Leg B CO) 113-4803-1101

Fig.20



305-9490001
Miami

HQ6	**1**
HQ5 BST	**1**
HQ4 Florida	**1**
HQ2 Leg A	**4**
HQ2 Leg B	**1**

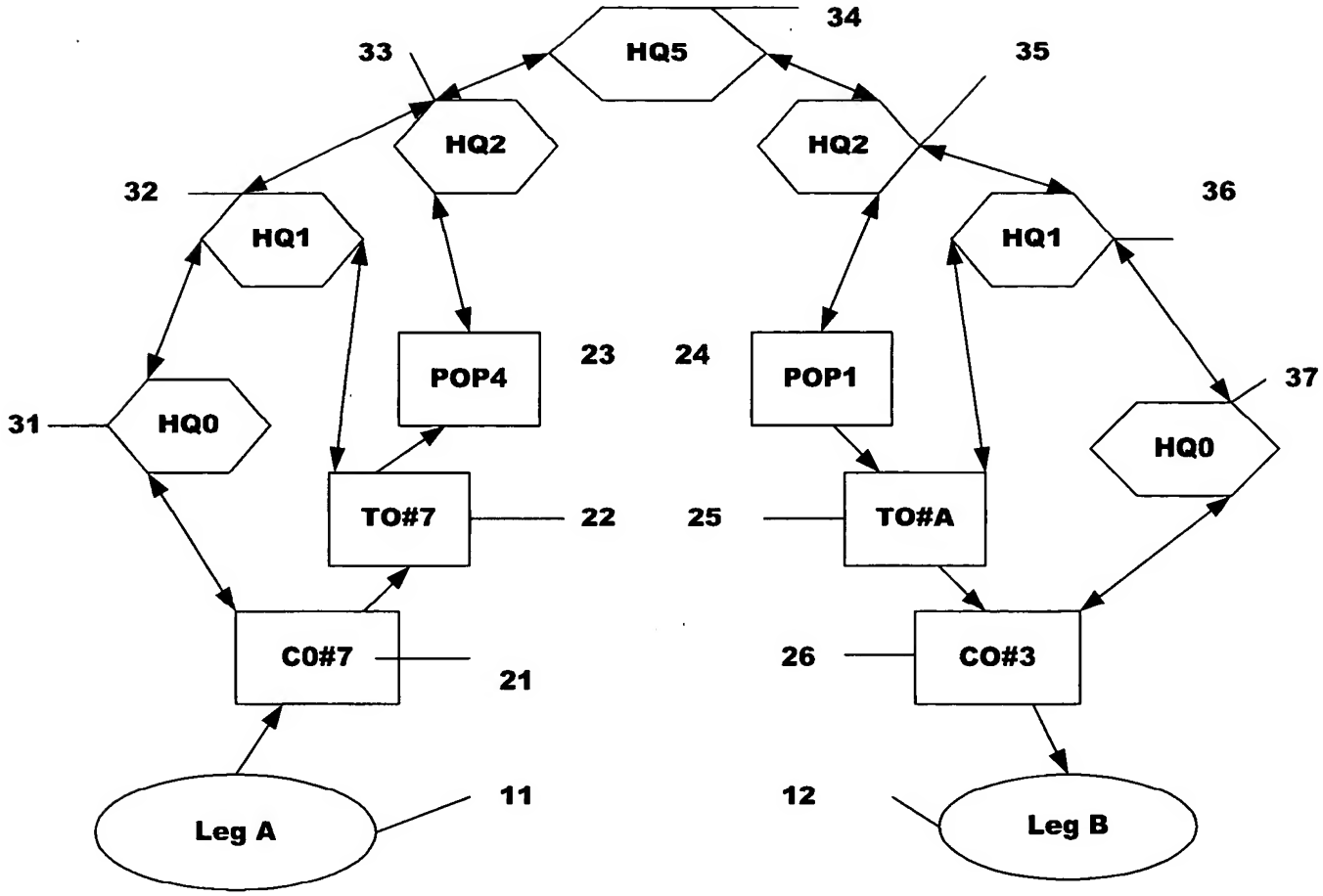
407 671 9999
Jacksonville

HQ3 Leg A	**3**
HQ3 Leg B	**2**
HQ1 Leg A	**8**
HQ1 Leg B	**1**

Leg A is 11134803 **Leg B is 11121105**
CO 1134803 initiates the call. CO 11 owns the call and generates the Vector CDR. HQ4. At least 6 CDR must be correlated to make the billing entity.

Vector Magnitude looks like this: 11 (Owner) 34803 (Leg A CO) 21105 (Leg B CO) 11-34803-21105

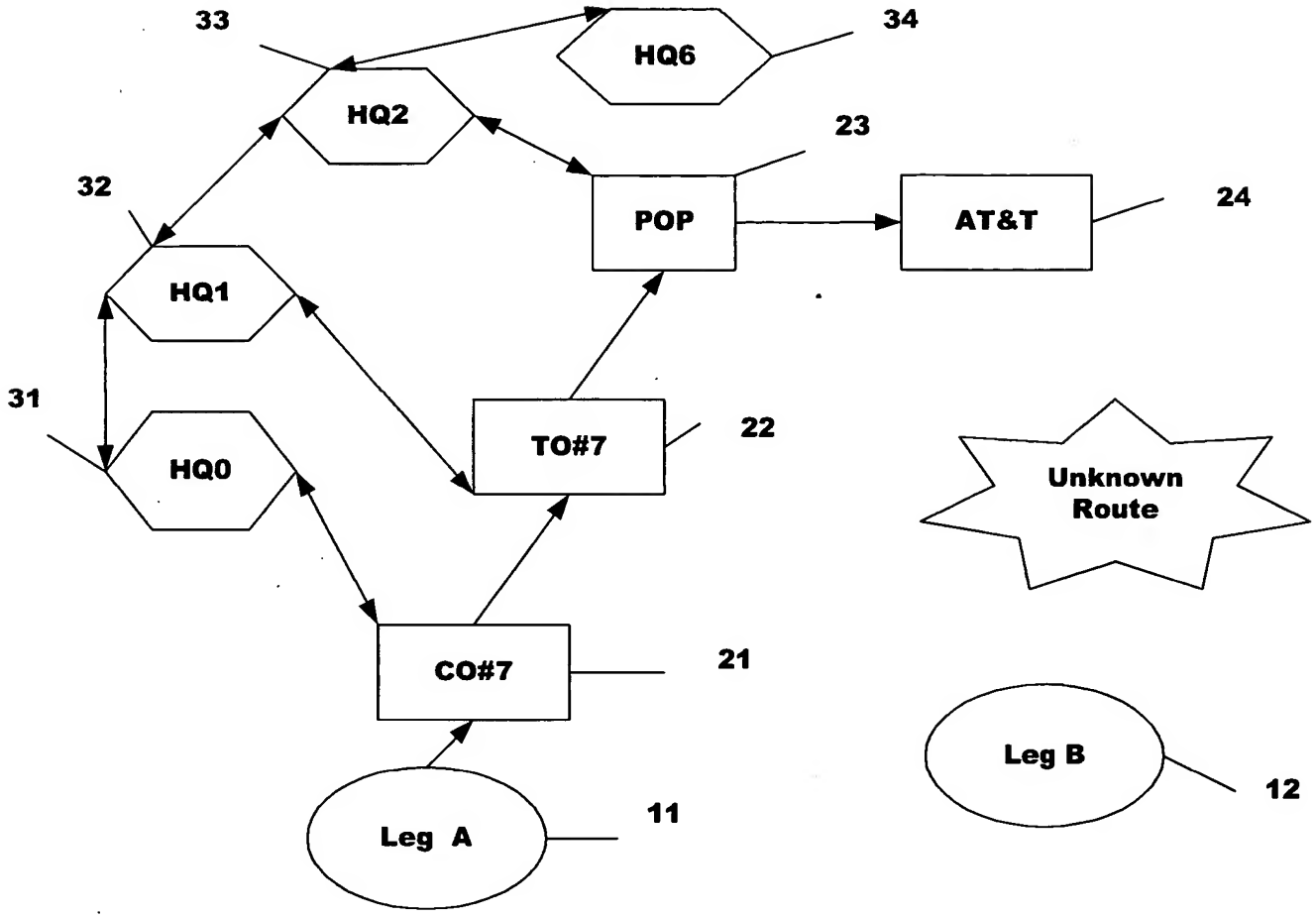
Fig.21



305-525-0001	
Miami	
HQ6	**1**
HQ5 BST	**1**
HQ4 Florida	**1**
HQ3SFla	**3**
HQ2	**4**
HQ1	**7**
Leg A is 11134707	

404-777-1234	
Atlanta	
HQ5 BST	**1**
HQ4 Georgia	**2**
HQ3 N Geo	**1**
HQ2	**1**
HQ1	**A**
Leg B is 11211A03	

Fig.22



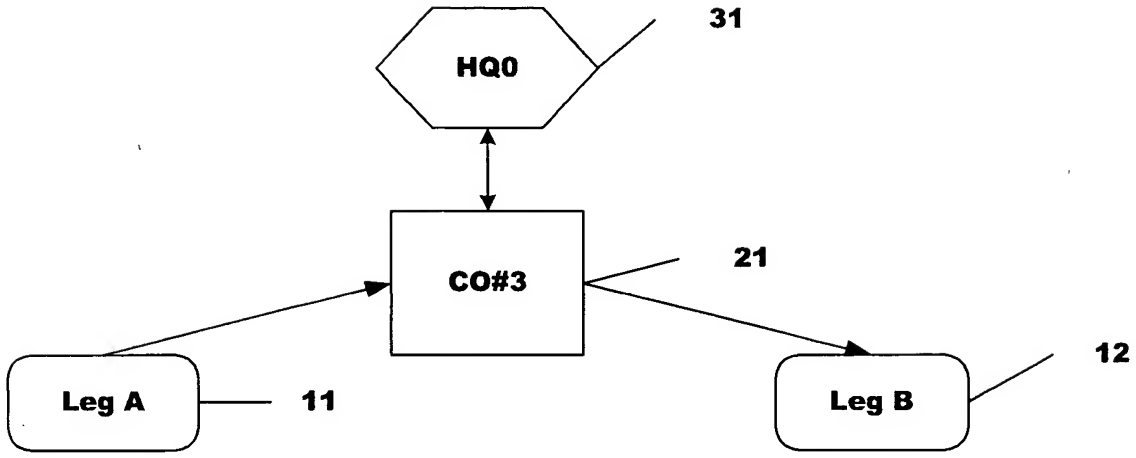
305 525 0001
Miami

HQ5 BST	**1**
HQ4 Florida	**1**
HQ3 S. Fla	**3**
HQ2	**4**
HQ1	**7**

011502261324
Guatemala
HQ5 AT&T 1

Leg A is 1134707 Leg B is out of the domain.
CO 1134807 initiates the call. HQ6* owns the call and Generates the Vector CDR. At least 3 CDR must be correlated to make the billing entity.##### International ### Regional (CLEC) # Local (CLEC). CLEC the subscriber belongs to another network.
Vector Magnitude looks like this: 1 (Owner) 134707

Fig.23



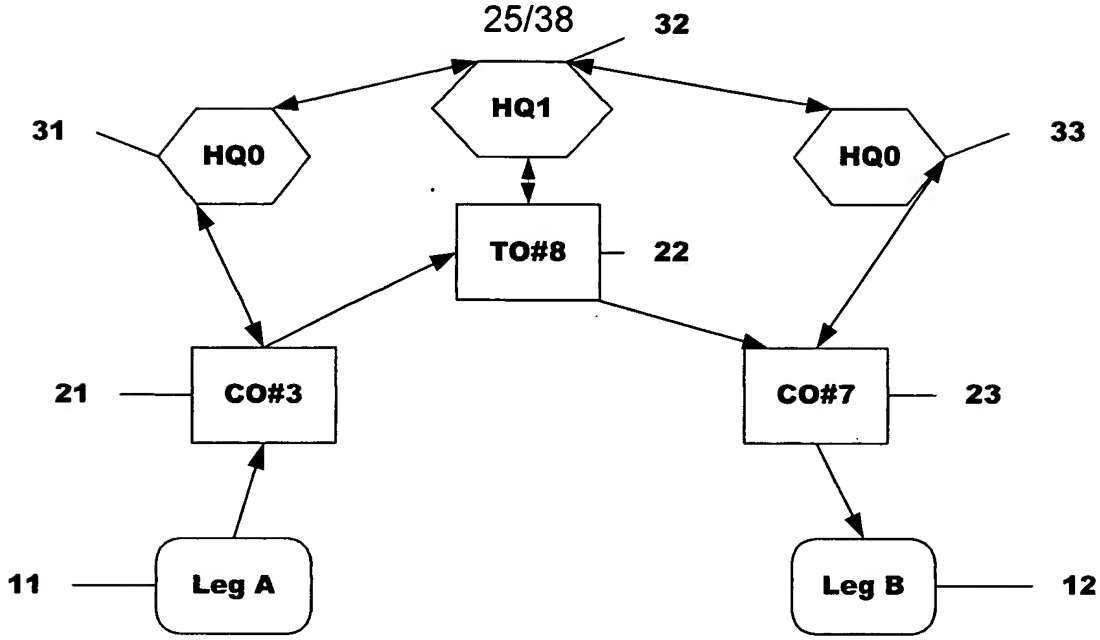
Calling Party Leg A
305 948 1234
NPA-NXX-EXTN

Called Party Leg B
305 948 5678
NPA-NXX-EXTN

Calling Party request dial tone and then the subscriber dials
305 948 5678#

HQ6	**1**		
HQ5 is BST	**1**	**HQ2 is Miami**	**4**
HQ4 is Florida	**1**	**HQ1 is Miami**	**8**
HQ3 is S.Fla	**3**		
Leg A is 11134803		**Leg B is**	
11134803			

Fig.24



Calling Party Leg A
305 948 1234
NPA-NXX-EXTN

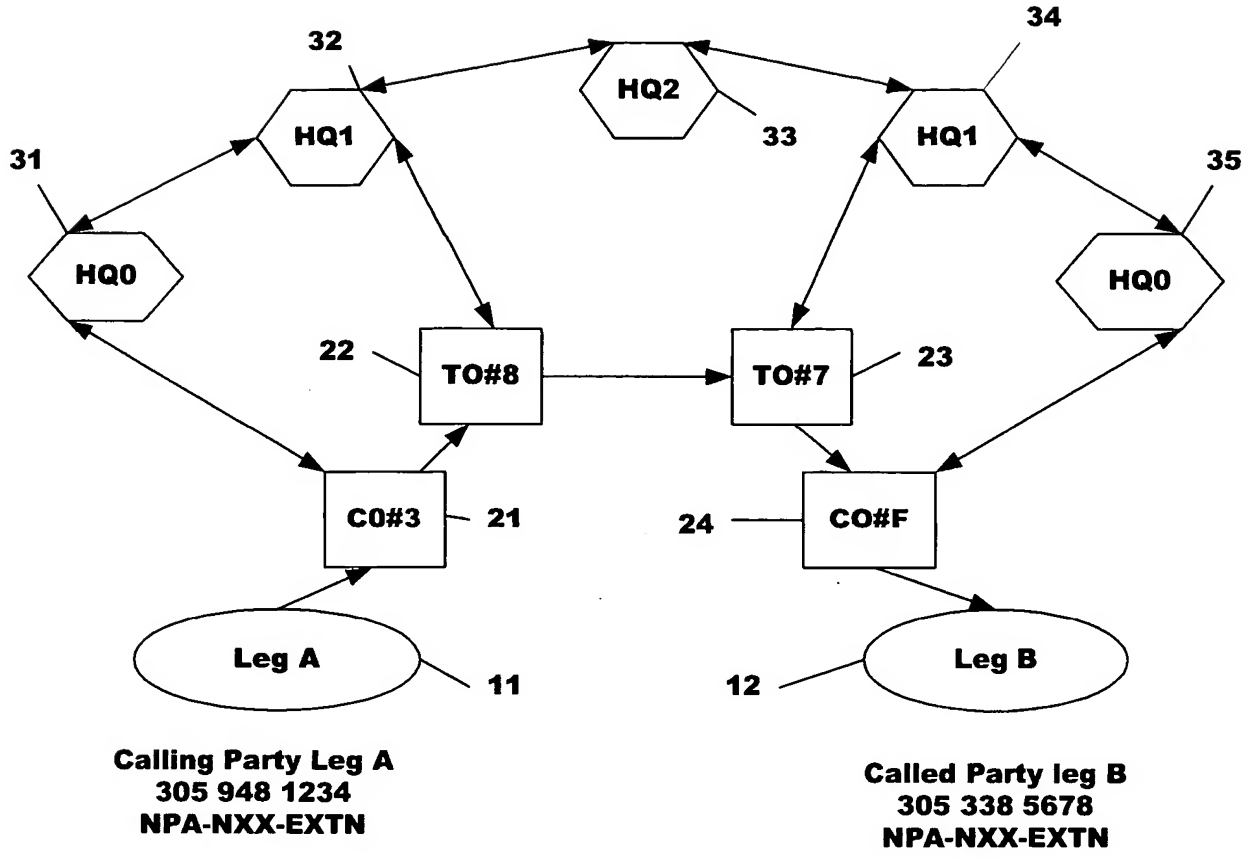
Called Party Leg B
305 938 5678
NPA-NXX-EXTN

Calling Party request dial tone and then the subscriber dials 305 938 5678

An (IAM) messages is sent as the CO determines that 305 938 5678 is doesn't belong to its Own domain. The HQO searches and determines that HQ1 is the most probable owner. HQO upon receiving the IAM messages creates a SSN and then send a HBS_Vector_CDR message to TO#8 IC. When the ANM or ACM message is received an Update_Vector_CDR message is generated and the HBS_Vector CDR is futher updated. Then a REL_A or REL_B message is received an a Release_Vector_CDR message is generated and HBS_Vector_CDR is futher updated. No Tandem data. EX 113108-03-07.

VectorTrajectory Update
CO#3 113##-03-## via forward chaining (FC) IAM message
TO#8 11308-03-## via forward chaining(FC) IAM Message
CO#7 11308-03-07 via backward chaining (BC) ACM message

Fig.25

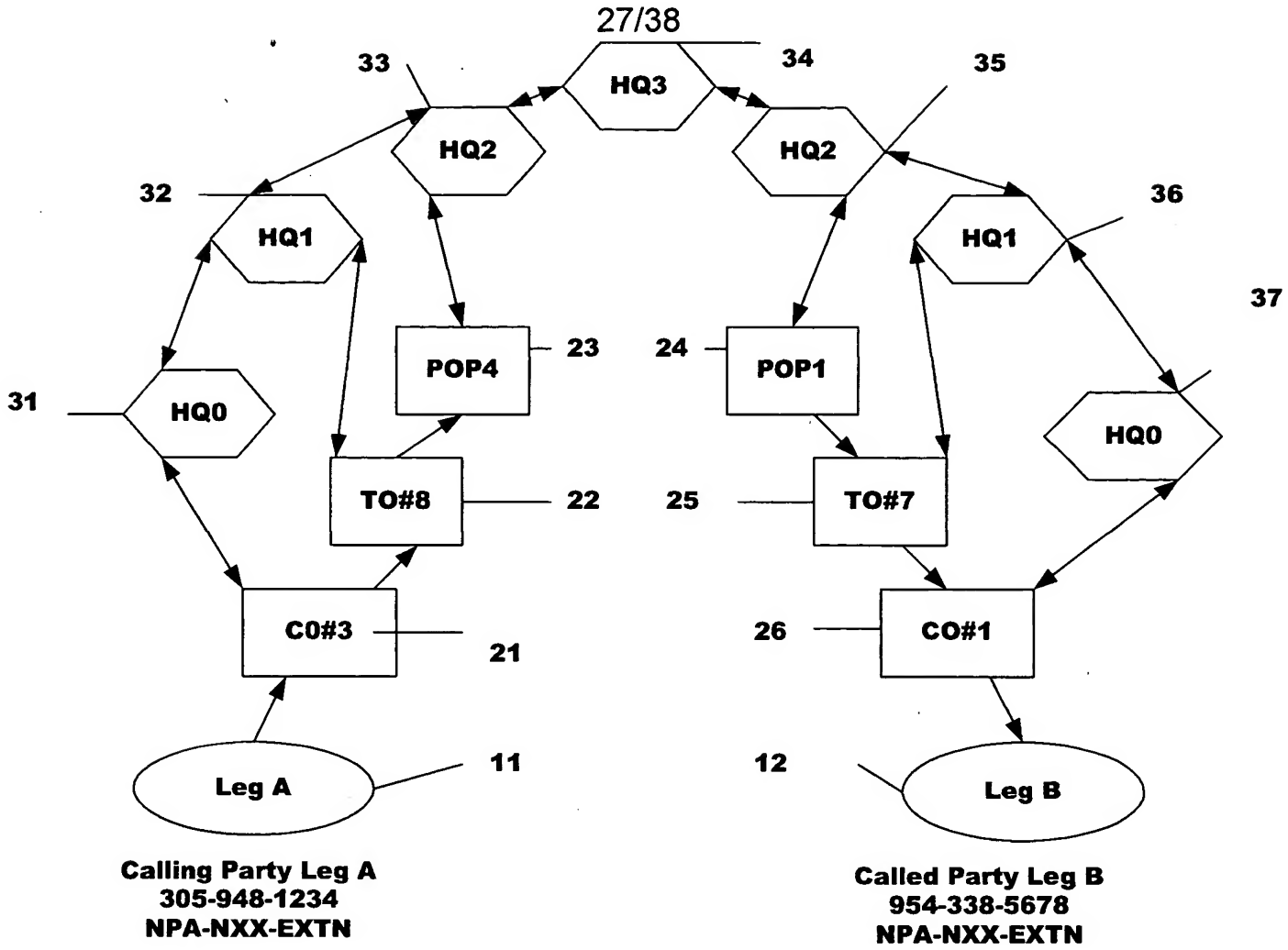


Calling Party request dial tone and then the subscriber dials 305 338 5678#

An (IAM) messages is sent as the CO determines that 305 338 5678 is doesn't belong to its own domain. The HQO searches and determines that HQ2 is the most probable owner.
HQO upon receiving the IAM messages creates a SSN and then send a HBS_Vector_CDR message to TO#8 IC, POP #4 IC, TO#7 IC, CO#OF IC. When the ANM or ACM message is received an Update_Vector_CDR message is generated and the HBS_Vector_CDR is further updated. Then a REL_A or REL_B message is received an a Release_Vector CDR message is generated and HBS_Vector _CDR is futher updated. No Tandem data. Ex 1134 -###-### Vector Trajectory Update.

CO#3	**1134-#03-##-**	**IAM(FC) Calling Party (Leg A) Owner**
TO#8	**1134-803-##-**	**IAM (FC)**
POP#4	**1134-803-##-**	**IAM (FC)HQ2 Miami, FLA(Dade County NPA) Vector Owner**
TO#7	**1134-703-7-##-**	**IAM (FC)**
CO#F	**1134-703-7OF-**	**ACN (BC) Called Party (Leg B) Owner.**

Fig.26

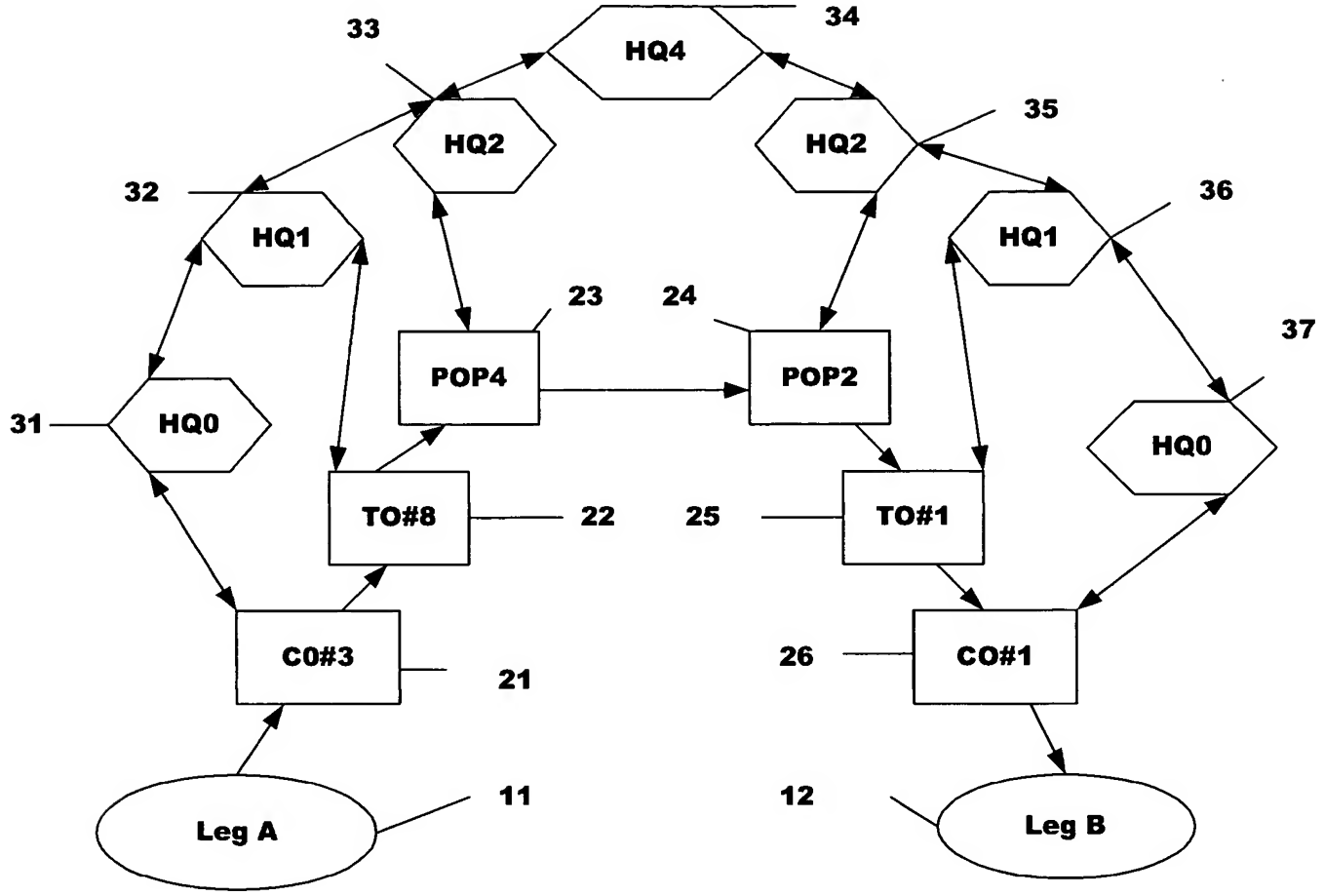


Calling party request dial tone and then the subscriber dials 954 338 5678

An (IAM) messages is sent as the CO determines that 954 3385678 is doesn't belong to its own domain. The HQ0 searches and determines that HQ# is the most probable owner.
HQ0 upon receiving the IAM messages creates a SSN and then send a HBS_Vector_CDR message to TO#8 IC, POP#4 IC, POP#1 IC, TO#7 IC, CO#1 IC. When the ANM or ACM message is received an Update_Vector_CDR message is generated and the HBS_Vector_CDR is further updated. Then a REL_A or REL_B message is received an a Release_Vector_CDR message is generated and HBS_Vector_CDR is further updated. No Tandem data EX .
113-####-####
Vector Trajectory Update

CO#3	**113-##03-###-**	**IAM (FC) Calling Party (Leg A) Owner**
TO#8	**113-#803-###-**	**IAM (FC)**
POP#4	**113-4803-1###-**	**IAM(FC) HQ3 South Florida Lata Vector Owner**
POP#1	**113-4803-1###-**	**IAM(FC)**
TO#7	**113-4803-17##-**	**IAM(FC)**
CO#	**113-4803-1701-**	**ACN (BC) Called Party (Leg B) Owner**

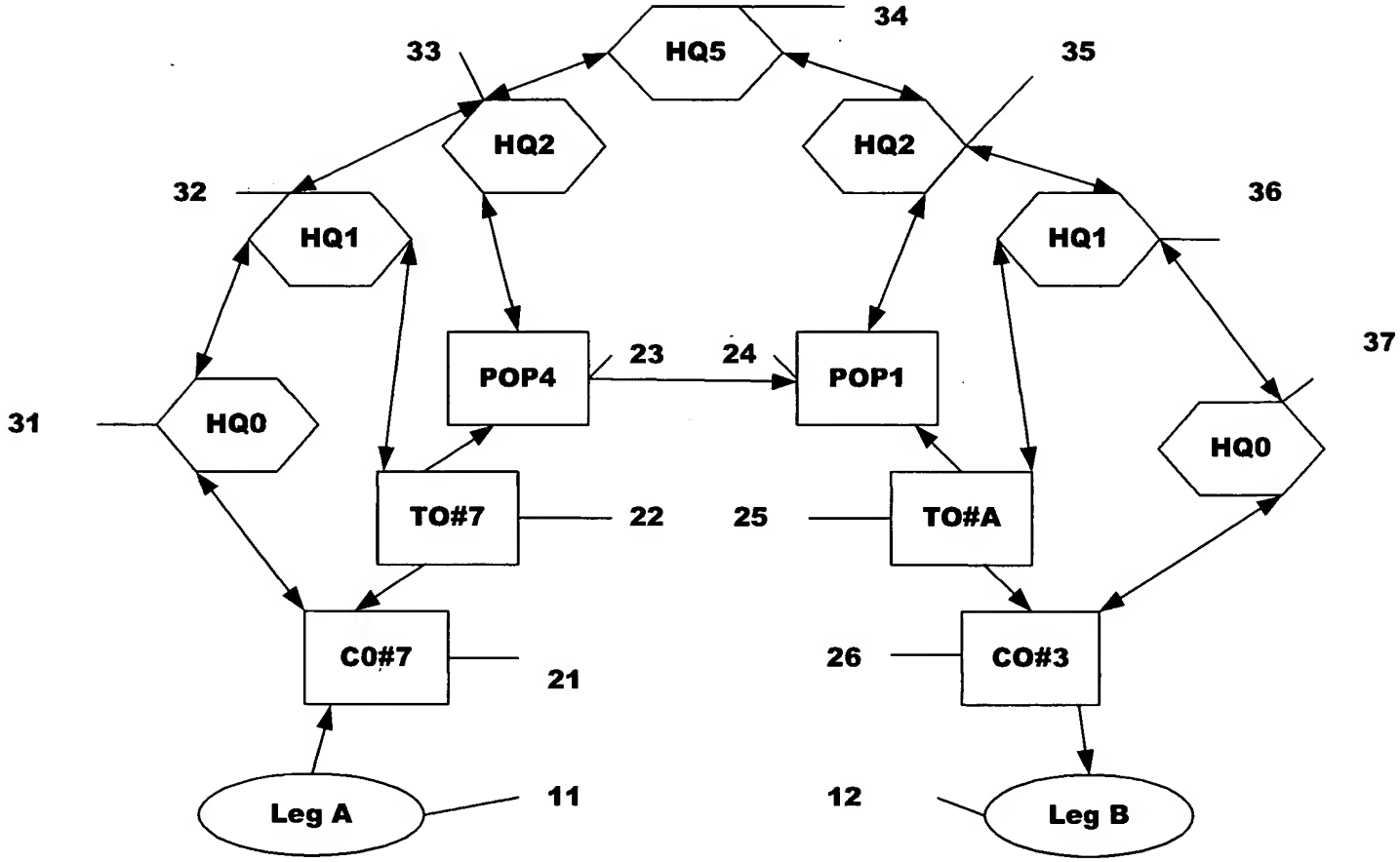
Fig.27



Calling Party request dial tone and then the subscriber dials 904 777 5678#.
*****This call has a Tandem POP connection between POP#4 and POP#2.**
An (IAM) messages is sent as the CO determines that 9047775678 is doesn't belong to its own domain. The HQO searches and determines that HQ4 is the most probable owner.
HQO upon receiving the IAM messages creates a SSN and then send a HBS_Vector_CDR message to TO#8 IC, POP#4 IC, POP#2 IC, TO#1 IC, CO#1 IC. When the ANM or ACM message is received an Update_Vector_CDR message is generated and the HBS_Vector_CDR is further updated. Then a REL_A or REL_B message is received an a Release_Vector_CDR message is generated and HBS_Vector_CDR is futher updated. EX 11-####-####-X- Vector Trajectory Update.

CO#3	**11-###03-####**	**IAM(FC) Calling Party (Leg A) Owner**
TO#8	**11-##803-###**	**IAM(FC)**
POP#4	**11-34803-###**	**IAM(FC) HQ4 Florida Domain Vector Owner**
PTO#X	**11-34803-###-X-**	**IAM(FC)**
POP#2	**11-34803-22###-X-**	**IAM(FC)**
TO#1	**11-34803-221##-X-**	**IAM(FC)**
CO#1	**11-34803-22101-X-**	**ACN(BC)Called Party (Leg B) Owner.**

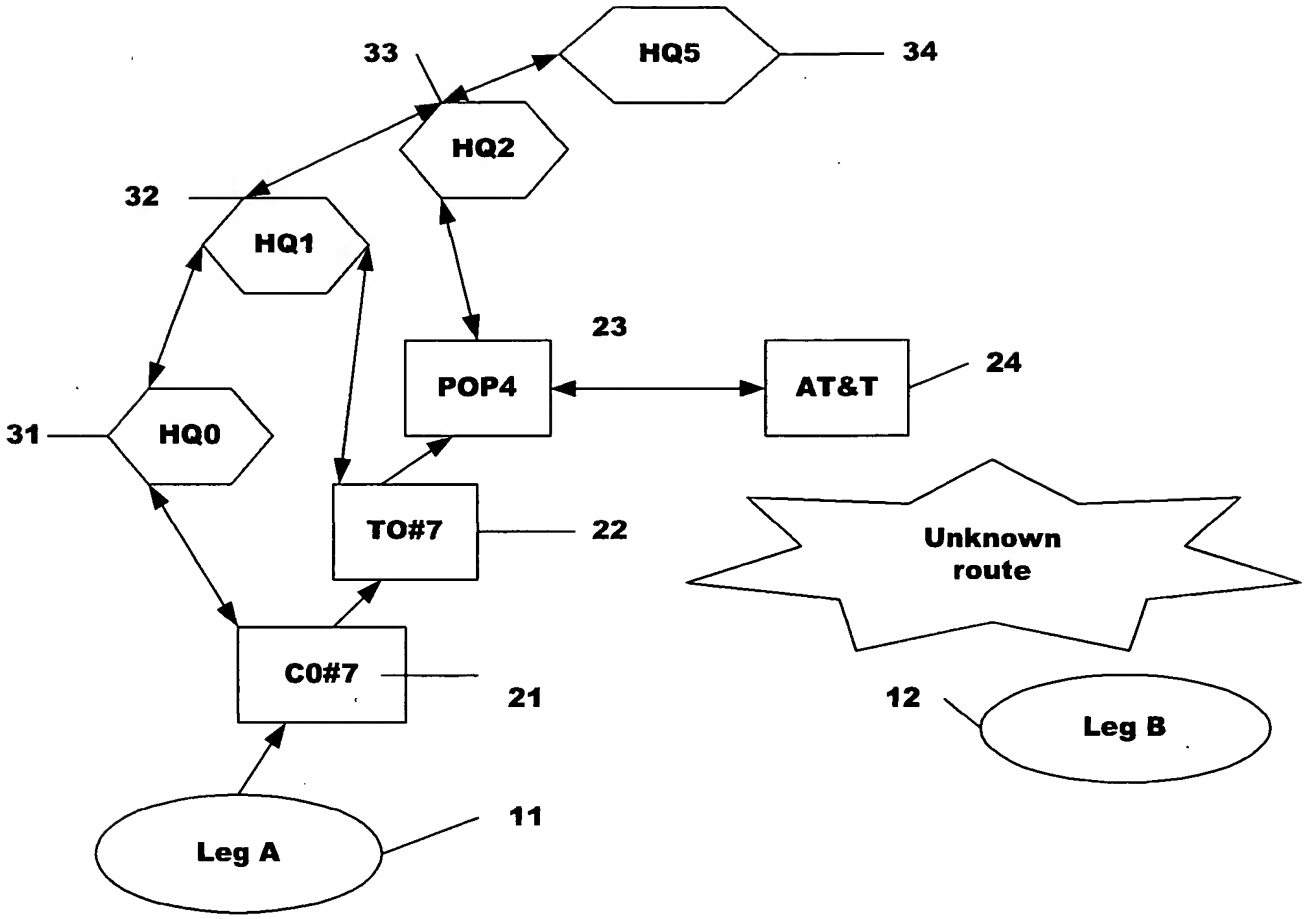
Fig.28



Calling Party request dial tone and then the subscriber dials 404 7775678#.
*****This call has a Tandem POP connection between POP#4 and POP#2.**
An (IAM) messages is sent as the CO determines that HQ5 is the most probable owner.
HQO upon receiving the IAM messages creates a SSN and then send a HBS_Vector CDR message to TO#8 IC, POP#4 IC, POP#2 IC, TO#1 IC, CO#1 IC. When the ANM or ACM message is received an Update_Vector_CDR message is generated and the HBS_Vector_CDR is futher updated. Then a REL_A or REL_B message is received and a Release_Vector_CDR message is generated and HBS_Vector_CDR is further updated. EX 11-####-####-X-.
Vector Trajectory Update.

CO# 3	**1-13##03-######-**	**IAM (FC) Calling Party (Leg A) Owner.**
TO#8	**1-13#803-######-**	**IAM (FC)**
POP#4	**1-134803-######-**	**IAM (FC) HQ5 BST Domain Vector Owner.**
PTO#X	**1-134803-#####-x-**	**IAM (FC)**
POP#2	**1-134803-21####-x-**	**IAM (FC)**
TO#1	**1-134803-2121##-x-**	**IAM (FC)**
CO#1	**1-134803-211101-X-**	**ACM (BC) Called Party (Leg B) Owner.**

Fig.29



Calling Party Leg A
305-948-1234
NPA-NXX-EXTN

Called Party Leg B
011-5022-1324
INT-CC-EXTN

Calling Party request dial tone and then the subscriber dials 011502261324#.
An (IAM) messages is sent as the CO determines that 011 5022 61324 is an international call and must be routed to AT&T. The HQ0 searches and determines that HQ5 is the most probable owner.HQ0 upon receiving the IAM message3s creates a SSN and then send a HBS_Vector_CDR message to TO#8 IC, POP#4 IC. When the ANM or ACM message is received an Update_Vector_CDR message is generated and the HBS_Vector_CDR is further updated.
Then a REL_A or REL_B message is received an a Release_Vector_CDR message is generated and HBS_Vector_CDR is further updated.EX 1~13####~
Vector Trajectory Update

CO#3	**1~13##03~**	**IAM (FC) Calling Party (Leg A) Owner**
TO#8	**1~13#803~**	**IAM (FC)**
POP#4	**1~134803~**	**IAM (FC) HQ5 BST Domain International Call**

When Leg B doesn't belong to the BST domain it is possible that the owning Vector HQ may adjust the vector trajectory.
Example a Call start from a Leg A owner which belongs to a CLEC but uses BST network.

Fig.30

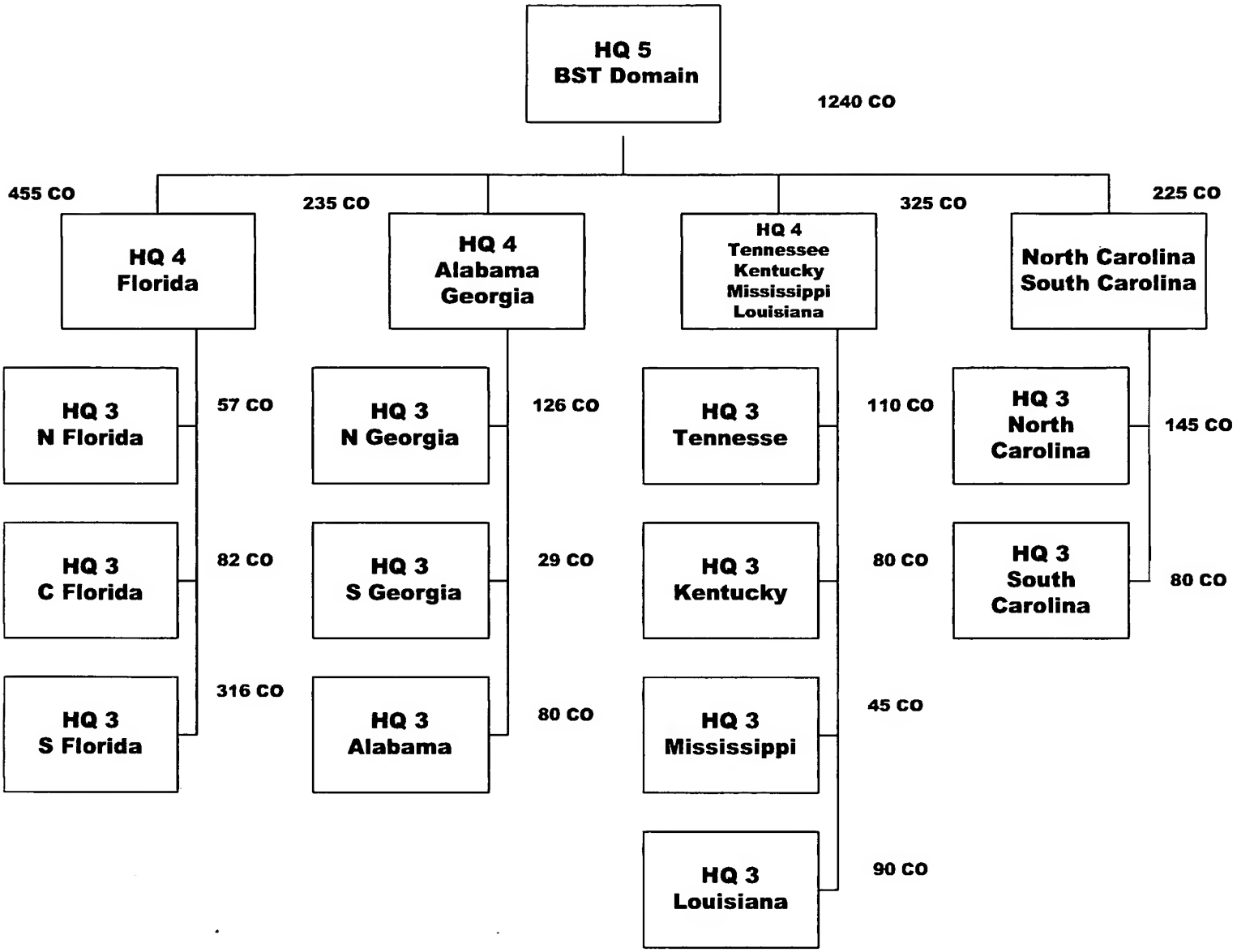

HQ 5
BST Domain
1240 CO
455 CO
235 CO
325 CO
225 CO
HQ 4
Florida
HQ 4
Alabama
Georgia
HQ 4
Tennessee
Kentucky
Mississippi
Louisiana
North Carolina
South Carolina
HQ 3
N Florida
57 CO
HQ 3
C Florida
82 CO
HQ 3
S Florida
316 CO
HQ 3
N Georgia
126 CO
HQ 3
S Georgia
29 CO
HQ 3
Alabama
80 CO
HQ 3
Tennesse
110 CO
HQ 3
Kentucky
80 CO
HQ 3
Mississippi
45 CO
HQ 3
Louisiana
90 CO
HQ 3
North
Carolina
145 CO
HQ 3
South
Carolina
80 CO

Fig.31

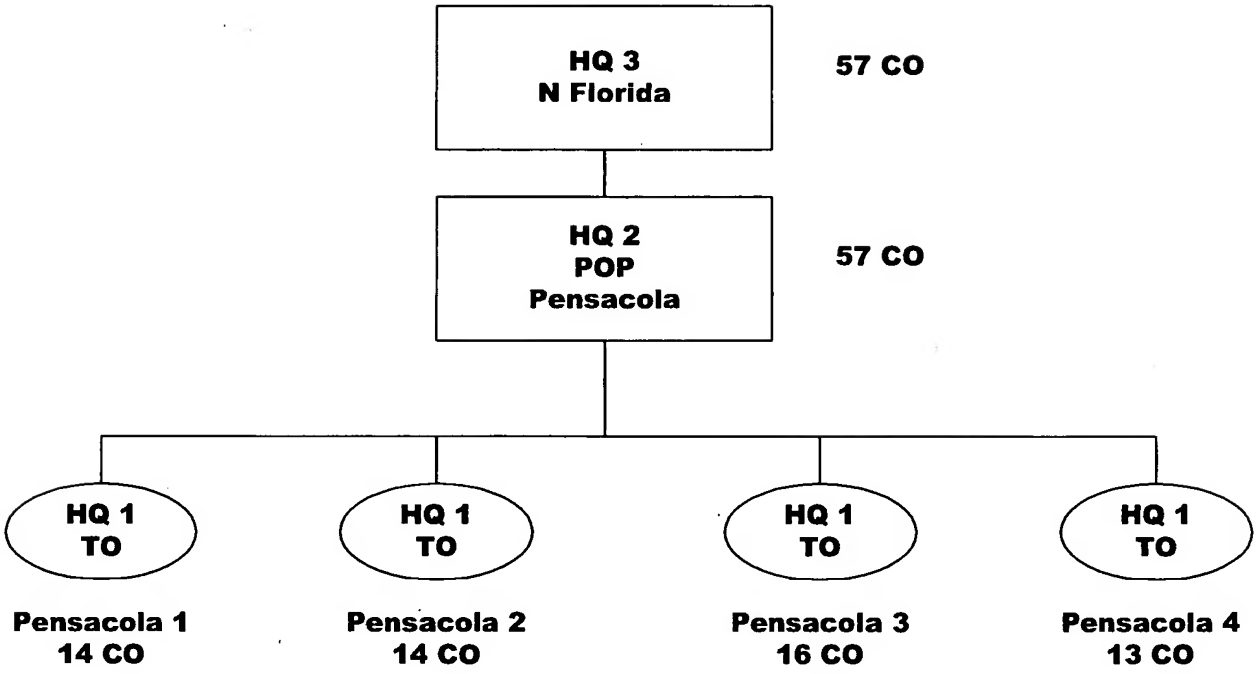

HQ 3
N Florida
57 CO
HQ 2
POP
Pensacola
57 CO
HQ 1
TO
HQ 1
TO
HQ 1
TO
HQ 1
TO
Pensacola 1
14 CO
Pensacola 2
14 CO
Pensacola 3
16 CO
Pensacola 4
13 CO

Fig.32

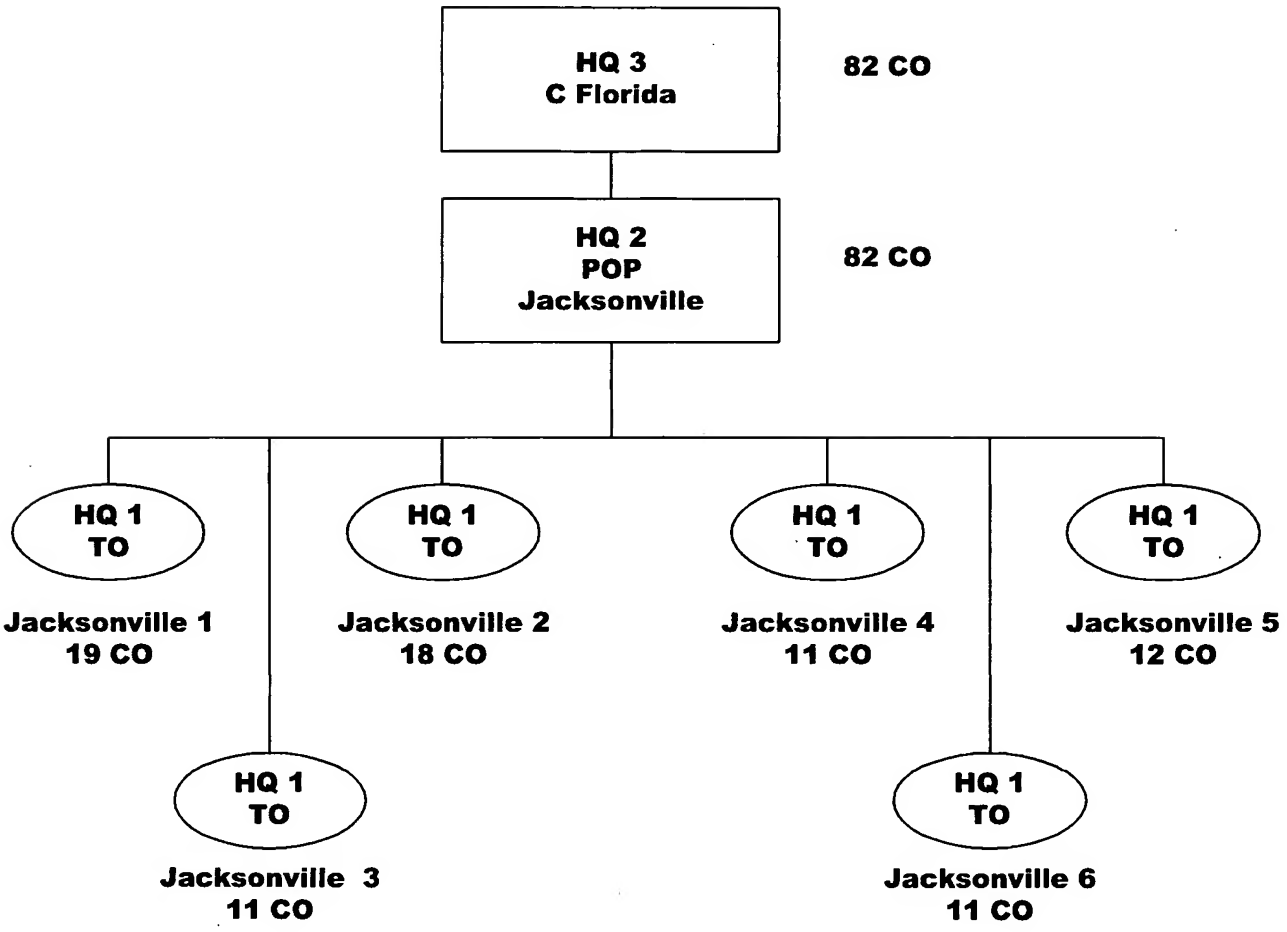

HQ 3
C Florida
82 CO
HQ 2
POP
Jacksonville
82 CO
HQ 1
TO
Jacksonville 1
19 CO
HQ 1
TO
Jacksonville 2
18 CO
HQ 1
TO
Jacksonville 4
11 CO
HQ 1
TO
Jacksonville 5
12 CO
HQ 1
TO
Jacksonville 3
11 CO
HQ 1
TO
Jacksonville 6
11 CO

Fig.33

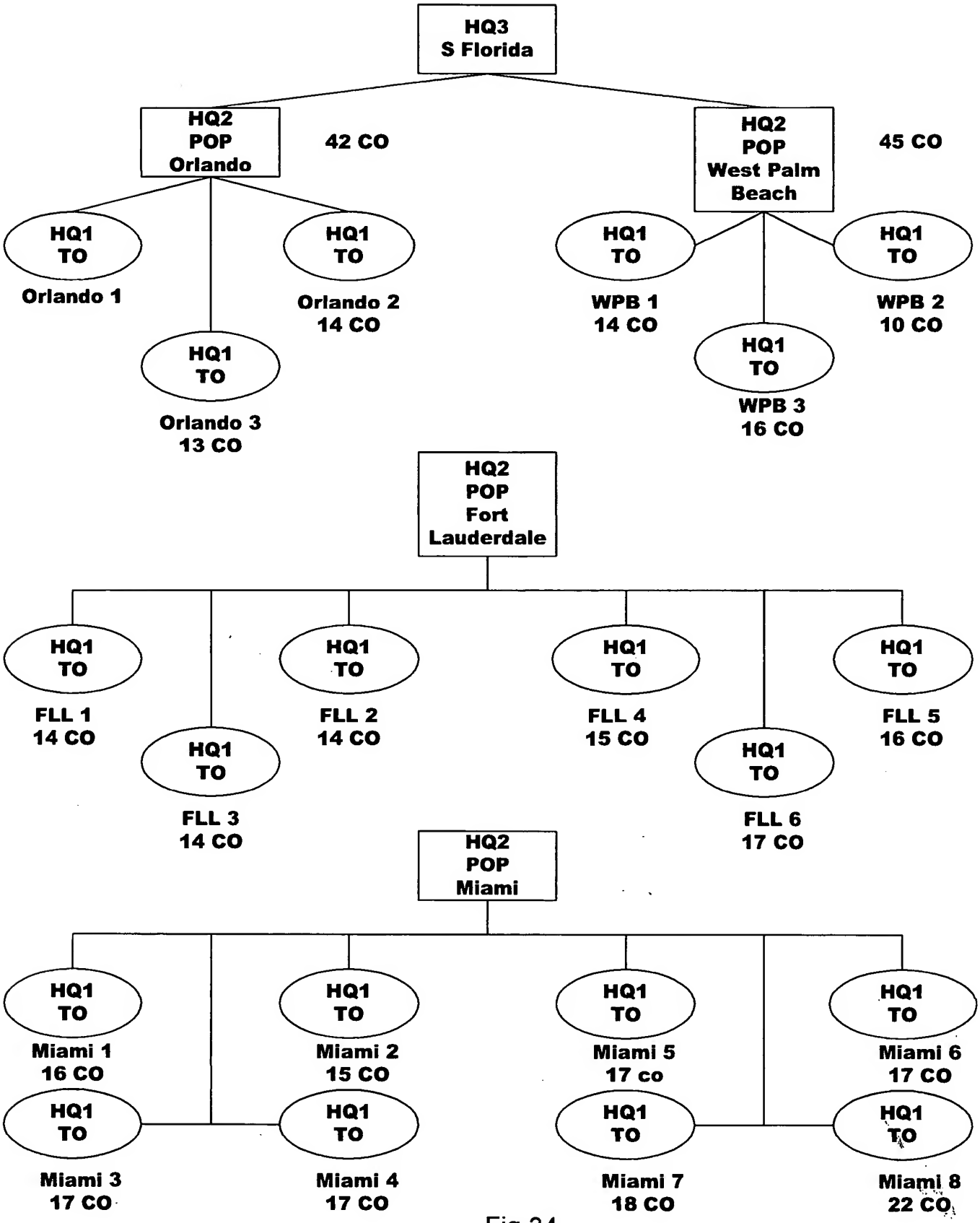

HQ3
S Florida
HQ2
POP
Orlando
42 CO
HQ2
POP
West Palm
Beach
45 CO
HQ1
TO
Orlando 1
HQ1
TO
Orlando 2
14 CO
HQ1
TO
Orlando 3
13 CO
HQ1
TO
WPB 1
14 CO
HQ1
TO
WPB 2
10 CO
HQ1
TO
WPB 3
16 CO
HQ2
POP
Fort
Lauderdale
HQ1
TO
FLL 1
14 CO
HQ1
TO
FLL 2
14 CO
HQ1
TO
FLL 3
14 CO
HQ1
TO
FLL 4
15 CO
HQ1
TO
FLL 5
16 CO
HQ1
TO
FLL 6
17 CO
HQ2
POP
Miami
HQ1
TO
Miami 1
16 CO
HQ1
TO
Miami 2
15 CO
HQ1
TO
Miami 3
17 CO
HQ1
TO
Miami 4
17 CO
HQ1
TO
Miami 5
17 co
HQ1
TO
Miami 6
17 CO
HQ1
TO
Miami 7
18 CO
HQ1
TO
Miami 8
22 CO

Fig.34

Richard S.Paiz
6014.0410

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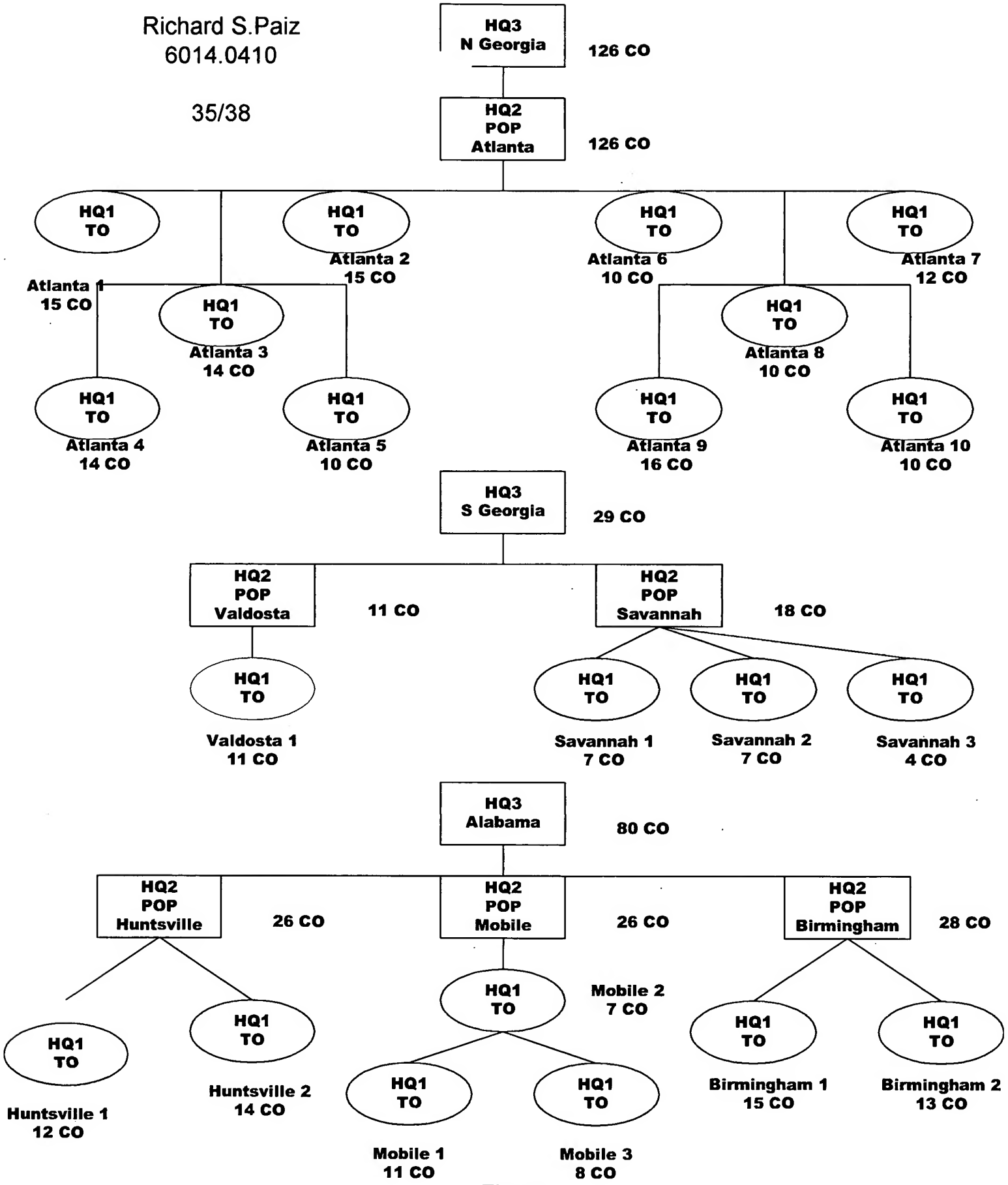


Fig.35

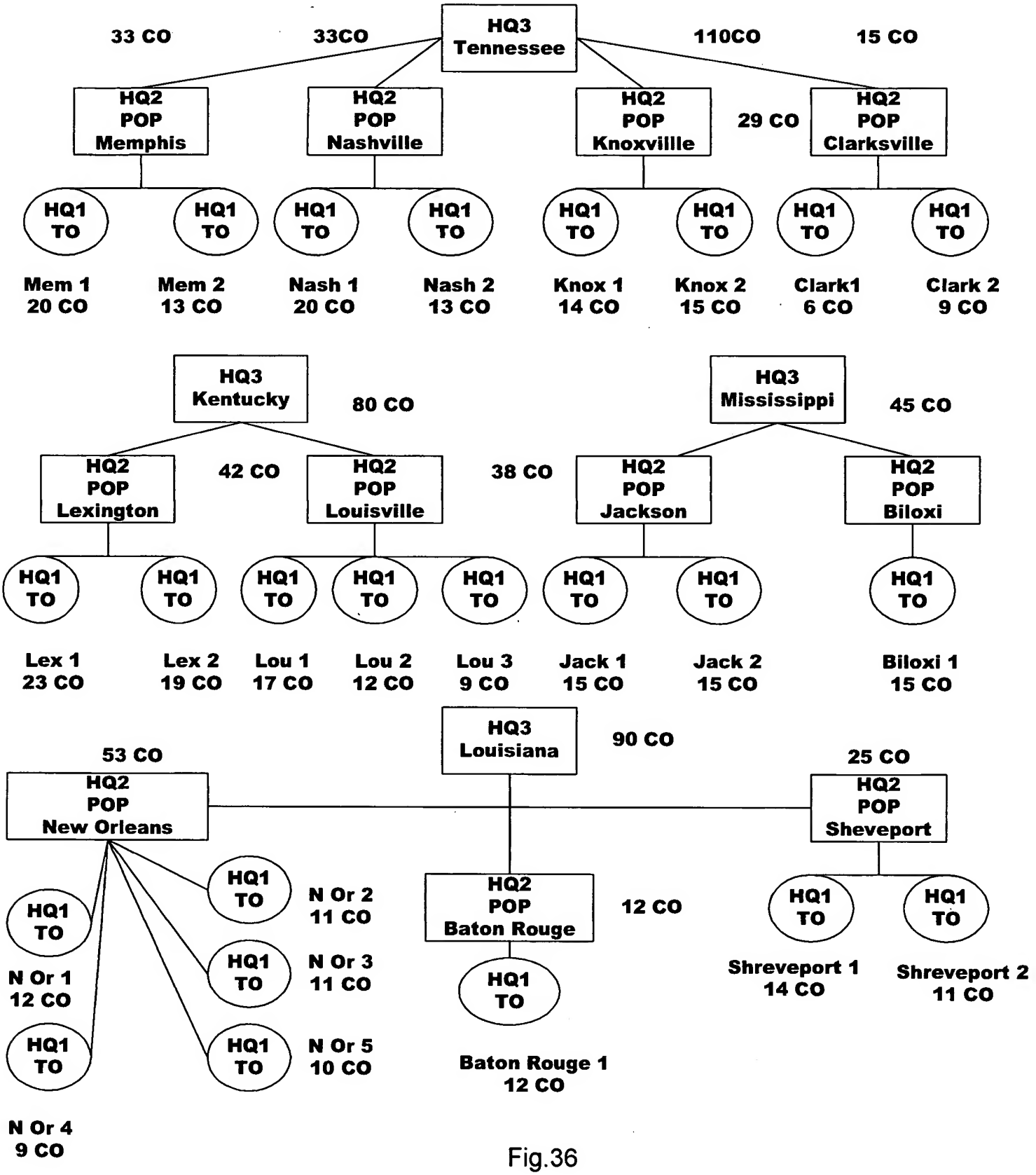

HQ3
Tennessee
33 CO
33CO
110CO
15 CO
HQ2
POP
Memphis
HQ2
POP
Nashville
HQ2
POP
Knoxvillle
29 CO
HQ2
POP
Clarksville
HQ1
TO
Mem 1
20 CO
Mem 2
13 CO
Nash 1
20 CO
Nash 2
13 CO
Knox 1
14 CO
Knox 2
15 CO
Clark1
6 CO
Clark 2
9 CO
HQ3
Kentucky
80 CO
HQ3
Mississippi
45 CO
HQ2
POP
Lexington
42 CO
HQ2
POP
Louisville
38 CO
HQ2
POP
Jackson
HQ2
POP
Biloxi
Lex 1
23 CO
Lex 2
19 CO
Lou 1
17 CO
Lou 2
12 CO
Lou 3
9 CO
Jack 1
15 CO
Jack 2
15 CO
Biloxi 1
15 CO
HQ3
Louisiana
90 CO
53 CO
25 CO
HQ2
POP
New Orleans
HQ2
POP
Sheveport
HQ2
POP
Baton Rouge
12 CO
N Or 1
12 CO
N Or 2
11 CO
N Or 3
11 CO
N Or 4
9 CO
N Or 5
10 CO
Baton Rouge 1
12 CO
Shreveport 1
14 CO
Shreveport 2
11 CO

Fig.36

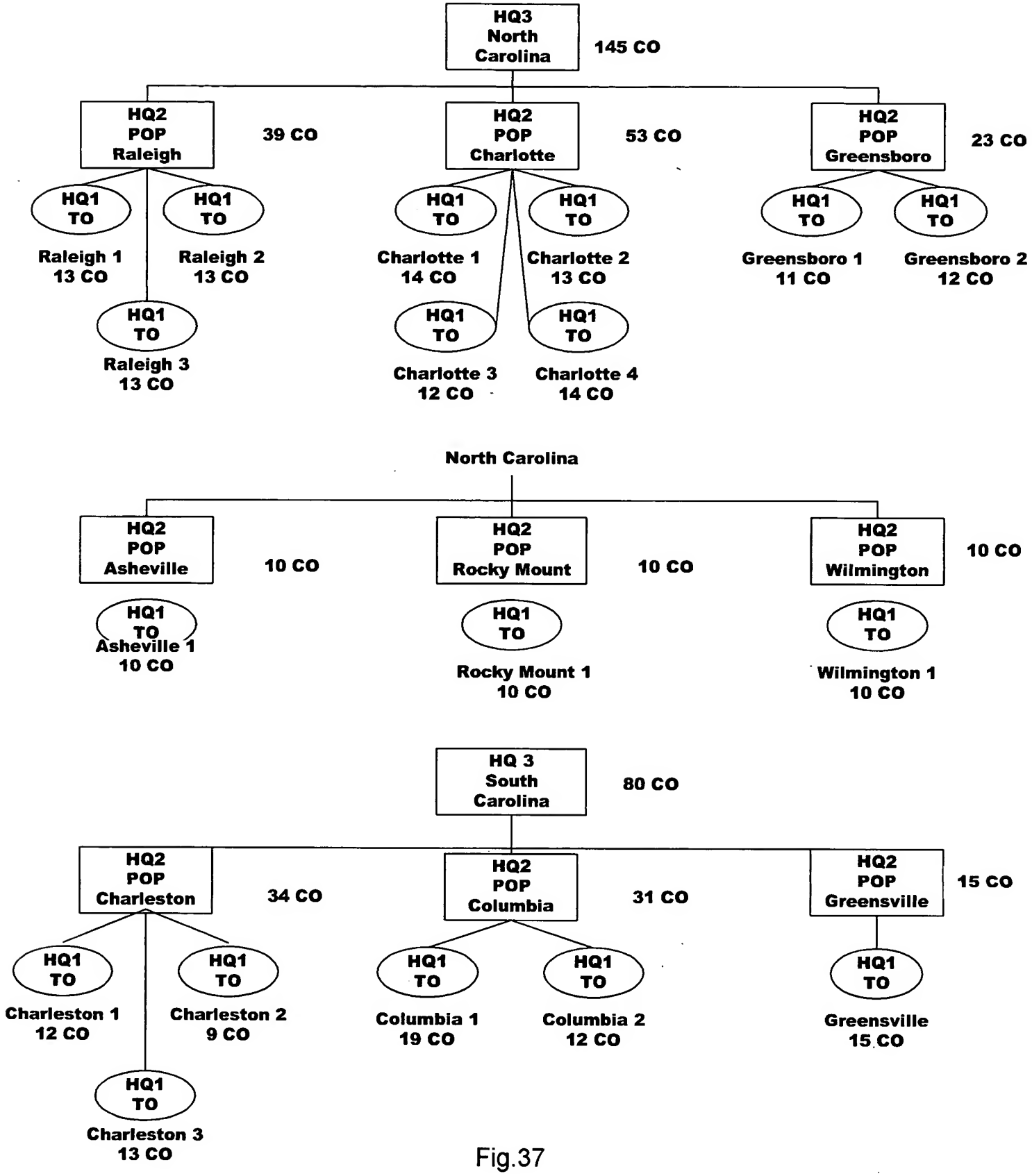
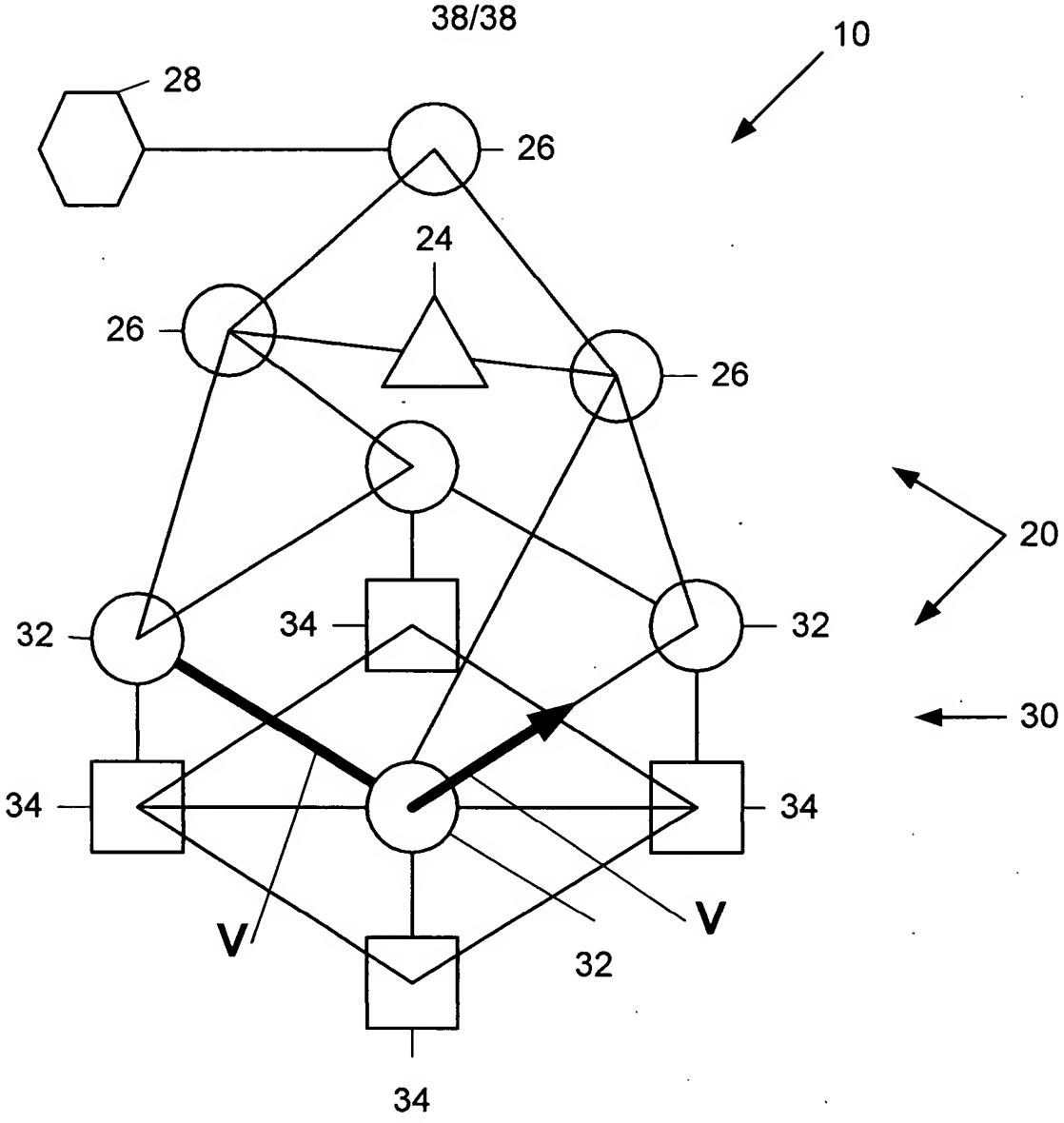

HQ3
North
Carolina
145 CO
HQ2
POP
Raleigh
39 CO
HQ2
POP
Charlotte
53 CO
HQ2
POP
Greensboro
23 CO
HQ1
TO
Raleigh 1
13 CO
HQ1
TO
Raleigh 2
13 CO
HQ1
TO
Raleigh 3
13 CO
HQ1
TO
Charlotte 1
14 CO
HQ1
TO
Charlotte 2
13 CO
HQ1
TO
Charlotte 3
12 CO
HQ1
TO
Charlotte 4
14 CO
HQ1
TO
Greensboro 1
11 CO
HQ1
TO
Greensboro 2
12 CO
North Carolina
HQ2
POP
Asheville
10 CO
HQ2
POP
Rocky Mount
10 CO
HQ2
POP
Wilmington
10 CO
HQ1
TO
Asheville 1
10 CO
HQ1
TO
Rocky Mount 1
10 CO
HQ1
TO
Wilmington 1
10 CO
HQ 3
South
Carolina
80 CO
HQ2
POP
Charleston
34 CO
HQ2
POP
Columbia
31 CO
HQ2
POP
Greensville
15 CO
HQ1
TO
Charleston 1
12 CO
HQ1
TO
Charleston 2
9 CO
HQ1
TO
Charleston 3
13 CO
HQ1
TO
Columbia 1
19 CO
HQ1
TO
Columbia 2
12 CO
HQ1
TO
Greensville
15 CO

Fig.37



Legend:

10: System
20: Simulation Network
24: Process Power Support Computers
26: Parent Simulation Computers
28: User Interface Computers.
30: Telecommunications Network
32: Junction point Simulation Computer
34: Telecommunication Network Junction Point Computers

Fig.38